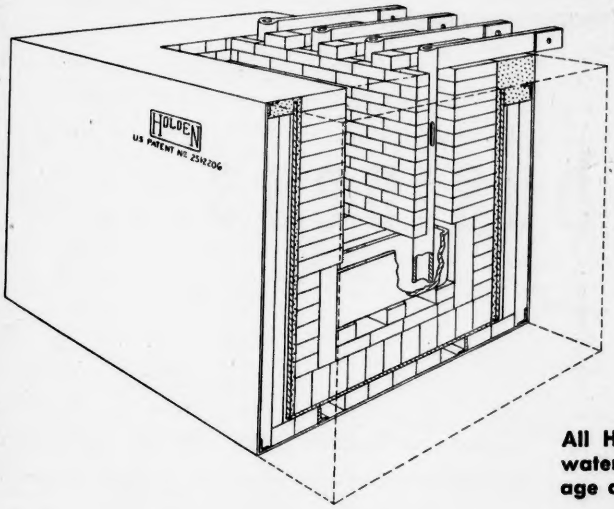
Metals Review

THE NEWS DIGEST MAGAZINE

Volume XXIV - No. 5 May, 1951

HOLDEN ELECTRODE FURNACES



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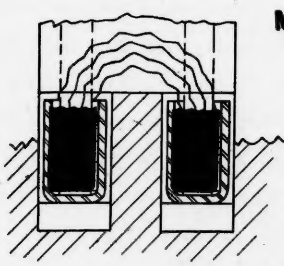

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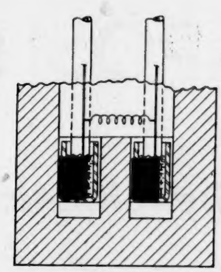

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Detroit, Michigan

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"Detroit Means Business"

Metals Review

THE NEWS DIGEST MAGAZINE

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VOLUME XXIV, No. 5 MAY, 1951

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AGAIN IN 1951!

AMERICAN SOCIETY FOR METALS

The Engineering Society of the Metals Industry,
receives TOP RATING for its publication of

MACHINING-THEORY AND PRACTICE

Selected as one of the
100 Best Technical and Scientific Books of the Year

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Over-All Picture of World Metals Situation Will Keynote World Metallurgical Congress

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Authorities From Europe and U. S. Will Cover Raw Materials and Resources, Iron and Steel, Nonferrous and Precious Metals Industries From Standpoint of Conservation, Substitution and Utilization

AN OVER-ALL picture of the metals situation of the world will keynote the World Metallurgical Congress, meeting in Detroit next fall under the sponsorship of the American Society for Metals. This picture will be presented in a general session at the beginning of the week of the Congress. The program will include a comprehensive summary of the raw materials situation in the metal industry of the world. Top-ranking authorities from a number of European countries, as well as the United States and Canada, will speak on the iron and steel, the nonferrous and precious metals industries of the important metal-producing and consuming countries. All of the speakers will stress problems of conservation, utilization, and substitution of the strategic metals. This program will be arranged under the direct supervision of Dr. Zay Jeffries, director-general of the World Metallurgical Congress.

The Congress will be held in Detroit concurrently with the National Metal Congress and Exposition for seven days beginning Oct. 13. Preceding the Detroit meetings, the hundreds of visiting conferees from all the free countries of the world will participate in four weeks of plant tours and inspections, providing an opportunity to observe at first hand business and technical know-how in leading American plants.

Conferees are expected to arrive in New York on Sept. 17. They will be divided into eight separate groups, and from New York will proceed upon separate plant tours covering eight categories of the metal industry. These categories are: steelmaking and refining; nonferrous refining, rolling and fabrication (copper, brass, bronze, aluminum, magnesium); ferrous rolling, forging and hot work in steel mills and heavy industry; stamping, cold work, machining and finishing in lighter industry; heat treatment; welding and joining; inspection and testing; and research, engineering societies, and universities.

Tour Groups Will Meet

A final summary of the knowledge acquired in these inspection trips, together with an opportunity for exchange of ideas between Americans, Europeans, Latin Americans, and Asians, will be provided in discussion group meetings in Detroit in these same eight categories. Each of the foreign conferees will have an "opposite number"—an American whose technical, scientific or business interests parallel his own as nearly as possible. All of the conferees in any of these eight groups, together with their American opposite numbers, will meet in separate sessions for the purpose of informal exchange of ideas and experiences. All conferees are invited to present brief statements (about 1500 words) on some aspect of metallurgical practice in his plant or country which he deems worthy of attention in all countries.

Scientific Sessions Planned

A third type of meeting during the World Metallurgical Congress will be technical sessions in which scientific papers by foreign savants will be presented. It is also expected that a number of papers dealing with more practical problems of conservation and substitution will be included in the program.

Several papers have already been received in A.S.M. headquarters, and titles of a dozen or so proposed contributions have been submitted. It is apparent from these advance notices that many new and unusual metallurgical developments in foreign countries will be described.

In addition to these special sessions of the World Metallurgical Congress, all of the conferees will be invited to attend the regular technical sessions of the A.S.M.

Of paramount importance to the visiting conferees will be an opportunity to study the exhibits in the National Metal Exposition, which promises to be the largest and most complete on record. At no other time or place in the world is there concentrated so large a group of metal engineers, with whom the visitors can discuss their problems, compare practices and products, and share scientific and technical knowledge.

Negotiations are under way with all free countries through their ambassadors and legations in Washington to insure attendance of highly qualified personnel. Valuable assistance along this line has been rendered by the American embassies abroad, as well as by the Economic Cooperation Administration and the U. S. Department of Commerce.

The World Metallurgical Congress is foreseen as a factor of immeasurable importance in cementing friendship among the free countries of the world, as well as in raising standards of living and combined strength.

The largest number of exhibitors ever to have space assigned as early as six months before the National Metal Congress and Exposition opens, is the 1951 record for the Metal Show in Detroit during the week of October 15-19. A total of 302 industrial firms and organizations had made reservations by May 1.

According to W. H. Eisenman, managing director of the Exposition, these early decisions to participate in the world's largest industrial exposition indicate clearly that the Metal Show has taken on new significance under the present world tension.

Getting things done better and faster and with efficient utilization and substitution of strategic materials will have widespread consideration in both the technical discussions and the practical demonstrations of equipment, processes and techniques during the five days in the Motor Capital.

Plans for the A.S.M. technical program are well under way, with 61 papers already received and in the hands of the Publications Committee for review. It is estimated that close to 250 papers will be presented in the combined technical sessions of the cooperating societies, exclusive of the World Metallurgical Congress sessions.

The Metal Show will be held at the Fair Grounds, where ample facilities are available to accommodate the unprecedented demand for space.

Tri-Chapter Meeting Is Practical Forum On Shaping of Metals

Reported by Marvin L. Steinbuch
Research & Development Department
Lunkenheimer Co.

A series of papers on the general theme of "Shaping of Metals", selected on the basis of their practical value to the metallurgist in the fabricating plant, featured the annual Tri-Chapter meeting of the Cincinnati, Columbus and Dayton Chapters of A.S.M. The meeting was held in Cincinnati on April 12, and marked the 13th consecutive year in which these three chapters have joined to sponsor a one day gathering of this type.

The meeting was opened by Russel Hastings, chairman of the Cincinnati Chapter, and Walter Jominy, A.S.M. national president. In the morning session C. L. Altenburger, research engineer, Great Lakes Steel Corp., spoke on "The Effect of Steel Mill Practice on Customer Requirements".

An excellent luncheon was followed by an interesting and humorous discourse by Bill Ball, consulting foundry metallurgist, R. Lavin & Sons, Inc., under the title "Why I Am Here".

In the afternoon A. J. Pepin, quality and research engineer, Wyman-Gordon Co., spoke on "New Developments in the Forging of Light Alloys". Summation of the morning and afternoon sessions was made by F. W. Boulger of Battelle Memorial Institute.

Dinner entertainment was provided by Jos. E. McGlynn (alias Sir Kensington Hume). The evening session featured Michael Field, partner, Metcut Research Associates, who presented a fine lecture entitled "A New Approach to Machinability Through Microstructure".

The program was so arranged as to allow a maximum amount of time for discussion following the presentation of each paper.

Air Reduction Builds New Plant

Air Reduction Co., Inc., has announced that it will construct a new $10,000,000 plant for the production of calcium carbide. The plant will be located at Calvert City, Ky., and will be operated by National Carbide Co., one of Air Reduction's ten operating divisions.

Wilson Speaks on Alloy Steels

Sustaining Members Night of Philadelphia Chapter: Claire C. Balke, Program Chairman; Ralph L. Wilson, Speaker; Joseph Gray Jackson, Chapter Chairman; A. W. Grosvenor, Drexel Institute of Technology

Reported by George L. Schiel
Metlab Co.

Speaking before the Philadelphia Chapter on Feb. 23, Ralph L. Wilson of Timken Steel and Tube Division called attention to the similarity and interchangeability of medium-carbon low-alloy constructional steels when compared and used in the fully quenched and tempered condition. Citing data accumulated through innumerable tests, Mr. Wilson indicated that the design engineer's requirement of concrete physical values can often be met by steels of more than one analysis. One significant difference in the behavior of the various grades is the different response to tempering.

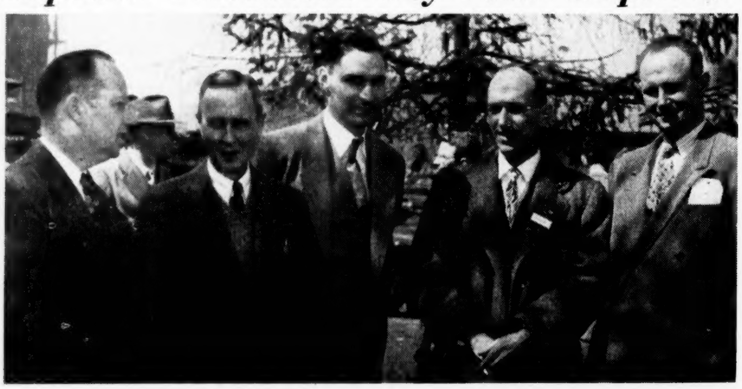
Mr. Wilson then proceeded to outline the limitations and the discrepancies noted at high hardness and strength levels (above 400 Brinell). Endurance limits, impact values, and notch sensitivity criteria were shown to approach or pass through peak values at approximately 400 Brinell. Mr. Wilson believes that unfavorable stress distribution is one of the factors influencing these discrepancies.

Favorable stress distribution is an aid to the mechanical properties of a structure, and Mr. Wilson cited shot peening, shallow hardening, temper quenching and case hardening as methods of obtaining such compressive stresses.

In closing, the speaker cautioned that while several steels may be metallurgically and property-wise similar, the design engineer and the metallurgist are obligated to consider other factors such as available alloying elements, machinability, ease of heat treatment and price.

The dinner and meeting were held in the newly completed Metallurgical Engineering Laboratories of Drexel Institute of Technology. As is the annual custom, sustaining members were honored at dinner.

Republic's Alabama City Plant Inspected



Part of the Group of A. S. M. Birmingham Chapter Members That Toured the Alabama City Plant of Republic Steel Corp.: John Middleton, Chief Metallurgist of the Plant; Prof. E. C. Wright, Head, Department of Metallurgical Engineering, University of Alabama; Samuel F. Carter, Assistant Melting Superintendent, American Cast Iron Pipe Co.; A. D. Gordon, Assistant Chief Metallurgist for Republic; and W. W. Austin, Research Metallurgist, Southern Research Institute. (Reported by E. A. Brandler, Secretary)

M. I. T. Offers Special Course on Steelmaking

A special course in the "Metallurgy of Steelmaking" has been announced by Massachusetts Institute of Technology, from June 13 to 23 during the summer session. The purpose of the course will be to review the principles of physical chemistry and their application to the control and development of the various steelmaking processes.

The course will be open to technically trained persons having an interest in the problems of iron and steelmaking and preferably having basic knowledge of chemistry. It will be under the direction of John Chipman, head of the department of metallurgy, and Nicholas J. Grant, associate professor in metallurgy.

Requests for further information should be addressed to Prof. Walter H. Gale, director of the summer session, Room 3-107, Massachusetts Institute of Technology, Cambridge 39.

New England Regional Council

Representatives of Five Chapters of the American Society for Metals Met in Worcester on March 9 to Complete Plans for the New England Regional Meeting Held in Boston on May 11. From left are Arthur L. Shields and Ralph Guertin of Springfield, John D. Paine, Jr., of Boston, Robert S. Morrow of Worcester, Peter R. Kosting of Boston, who presided, Dow M. Robinson of Boston, William A. Sherman and Arthur S. Johnson of Rhode Island Chapter, Harold F. Sprague of Hartford, W. Stanley Beecher of Springfield, and Francis J. Wolfer of Hartford. (Reported by C. Weston Russell, Public Relations Director, Worcester Chapter)

Five Lectures on Machinability Constitute Chicago Chapter's Educational Series

Reported by Thomas S. Simms
Research Information Service
The John Crerar Library

The fall educational program of the Chicago Chapter A.S.M. comprised a series of five lectures on machinability. This was the first integrated series of lectures sponsored by Chicago in recent years.

The registration fee of $4.00 included the cost of the A.S.M. book "Machining—Theory and Practice," which was used as a reference. Registration for the course totaled 306.

The lecturer for the entire series was Elbert A. Hoffman, manager, metallurgical sales department, La Salle Steel Co. The lectures were of one hour duration followed by a discussion period. The schedule was as follows:

Oct. 30—Physics of Metal Cutting
Nov. 6—Evaluation of Machinability
Nov. 20— Relation of Structure to Machinability
Nov. 27—Heat in Metal Cutting
Dec. 4—Economics of Machining

Mr. Hoffman opened the series with a detailed explanation of Merchant's work on machinability. He clarified many points of this classic presentation before covering the various properties and factors which enter into machinability problems.

Some of the points covered were: hardness, strain hardening, microstructure (including hard constituents such as alumina, silica and carbides) and heat treatment of work material; cutting conditions—speed, feed and coolant—and the type of finish desired on the workpiece.

The lecture on rake angles proved

B. R. Queneau, Chairman of Chicago Chapter's Educational Committee, and Elbert A. Hoffman of La Salle Steel Co., the Lecturer

to be especially interesting. Positive rake angles, Mr. Hoffman stated, produce the thinnest chips and use the least amount of power per unit volume of metal removed.

In the use of carbide tools for machining, excellent service is obtained by using a combination of negative and positive rake angles. An example was cited in which the primary rake angle was negative and the secondary rake angle was positive.

At the conclusion of the lecture series everyone had learned that the best machining practice requires a maximum amount of metal removal with a maximum tool feed and a cutting speed adjusted to produce the most economical tool life.

Metallurgical Curricula Lay Greater Emphasis On Scientific Aspects

Reported by D. Douglas Whyte
Los Alamos Scientific Laboratory

"A metallurgist should be part engineer and part scientist, with the trend toward more scientific training," asserted John Chipman, head of the department of metallurgy at Massachusetts Institute of Technology, addressing the Los Alamos Chapter A.S.M. on March 26. Dr. Chipman spoke on "The Current Problems of Metallurgical Education".

In planning a curriculum, Dr. Chipman explained that we should know what metallurgists do after graduation and what courses would best prepare the students to enter these fields. Some go into sales engineering, a small percentage continue to advanced degrees and onward into research, and the great majority go directly into industry upon receipt of bachelor's degrees.

The principal recent changes in the curriculum of Dr. Chipman's metallurgical department have been to increase the emphasis on the scientific aspects of physical metallurgy, and to group individual courses in the metallurgy of specific metals, such as iron and copper, into one course in metallurgical engineering modeled after successful courses in chemical engineering.

Dr. Chipman further pointed out the need for methods of influencing students toward metallurgical education. Some methods mentioned were metallurgical exhibits for the prospective student, acceptance of physicists and chemists for graduate work in metallurgy, and favorable propaganda by A.S.M. individual chapters.

Grossmann Memorial Lecture Given By T. E. Eagan; Nodular Iron is Subject

Reported by J. G. Cutton
Metallurgist, United States Steel Co.

The second annual Grossmann Memorial Lecture honoring Marcus A. Grossmann, past president of A.S.M. and director of research, U. S. Steel Co., was presented at the Mahoning Valley Chapter meeting on March 13. The lecturer, who was T. E. Eagan, chief metallurgist of Cooper Bessemer Corp., is selected from the chapter's membership. Karl L. Fetters, assistant to the vice-president of Youngstown Sheet and Tube Co., was last year's lecturer. Dr. Grossmann, a former Youngstowner, was present and spoke briefly.

"A New Engineering Material — Nodular Iron" was the subject presented by Mr. Eagan, whose company initiated the first commercial heat of nodular iron on Feb. 5, 1949. It has systematically developed and applied this new material since it was patented by International Nickel Co. Finished castings produced during 1950 amounted to 20,000 tons.

Nodular iron has physical properties between cast iron and cast steel, and Mr. Eagan presented comparative data for illustration. By the use of alloys and by controlling the size and distribution of graphite flakes in cast iron, it has long been possible to obtain a material with 70,000 psi. tensile strength. Now, with a single small alloy addition of 0.06 to 0.08% magnesium, the 70,000 psi. tensile strength is likewise obtained. The most striking difference between the two types of iron is that the magnesium-treated iron has the graphite present in nodular or globular form, while the alloy iron has flake graphite. One advantage is that, after annealing the nodular iron, (which results in a small reduction in the tensile strength), a considerable amount of ductility (approximately 5 to 15% elongation in 2 in.) is possible, depending upon section size. Furthermore, unnotched impact strength is increased to over five times that of the alloy cast iron.

T. E. Eagan, Who Lectured on Nodular Iron, and Marcus A. Grossmann, in Whose Honor the Lectureship Was Established Last Year

In pressure testing of compressor heads, with cast steel (72,200 psi. tensile) rated at 100, annealed nodular cast iron (67,400 psi. tensile) rated 93, alloy cast iron (71,900 psi. tensile) rated 66, and grey cast iron (44,700 psi. tensile) rated 40.

In another application of tapered generator shafts (7½ to 12 in. diameter) nodular iron has replaced alloy cast iron (50,000 psi. tensile) and is considered a superior material. This nodular iron shafting is 28% cheaper than was the original forged steel shafting.

DON'T MISS—
World Metallurgical Congress
National Metal Congress
National Metal Exposition
Detroit—Oct. 15 to 19, 1951

Machining Book Rated Among 100 Best of Year

"Machining—Theory and Practice", published by the American Society for Metals last June, is included among the "100 Best Technical Books of the Year". This list of best books is compiled by Reginald Hawkins, head of the science and technology division of the New York Public Library. It was published in the Spring Technical and Business Book issue of the *Library Journal.*

"Machining—Theory and Practice" consists of a series of 13 educational lectures presented during the National Metal Congress in 1949. The lectures were written and delivered by individual experts in various aspects of machining.

This is the second consecutive year that A.S.M. books have been so honored. Last year two titles ranked among the 100 best—namely, "Stainless Steels—an Elementary Text for Consumers" by Carl Zapffe, and "Cold Working of Metals", a series of papers presented at the seminar sessions of the National Metal Congress.

Austin and Thum at Utah For National Officers' Night

Reported by H. Edward Flanders
University of Utah

Utah Chapter A.S.M. held its National Officers' Night on March 29, with James B. Austin, A.S.M. trustee, and Ernest E. Thum, editor of *Metal Progress,* as the principal speakers.

Dr. Austin, who is director of research, United States Steel Co., spoke on "Magnification in Time—Some Applications of High-Speed Photography to Metallurgy". Mr. Thum spoke on "The Future of Metallurgy", and also added some remarks about affairs at national headquarters. Dr. Austin presented silver certificates for 25 years of consecutive membership to Walther Mathesius and H. Ed. Flanders.

Past Chairmen of the Mahoning Valley Chapter Who Were Present to Hear the Second Annual Grossmann Lecture: J. E. Phillips, Cold Metal Products Co. (1948); E. E. McGinley, U. S. Steel Co. (1941); M. A. Grossmann; H. H. Johnson, National Malleable & Steel Castings Co. (Present Chairman); T. E. Eagan, Cooper Bessemer Corp., Speaker and Past Chairman (1945); R. W. Justice, Houghton Oil Co. (1949); M. A. Hughes, U. S. Steel Co. (1946). (Photographs by Henry Holberson, Youngstown Sheet and Tube Co.)

Experts Answer Questions on Alloy Steelmaking and Processing

Canton-Massillon Chapter Members Were Able to Get Solutions to Many of their Alloy Steelmaking Problems From Experts at the March Meeting. Answering questions were: Robert K. Kulp, assistant manager-development, Electro Metallurgical Div., Union Carbide and Carbon Corp.; Chester B. Williams, general superintendent, Massillon Steel Castings Co.; Walter M. Farnsworth, assistant district manager, Republic Steel Corp.; Harry F. Walther, melt shop superintendent, Timken Steel and Tube Division; Karl Fetters, assistant to vice-president in charge of operations, Youngstown Sheet and Tube Co.; Leland Peterson, assistant melt shop superintendent, Timken Steel and Tube Division; Sterling P. Bahmer, mill metallurgist, Republic Steel Corp. Mr. Walther served as panel chairman and discussion leader

Reported by D. J. Girardi

Metallurgical Department
Timken Steel and Tube Division

An innovation for the Canton-Massillon Chapter was a panel meeting on March 9 on "Alloy Steelmaking and Processing." Chapter members were given an opportunity to bring their particular alloy steel problems before a group of experts boasting a sum total of well over 100 years' experience in the making and processing of alloy steels.

The meeting turned into a lively discussion on numerous specific problems covering all aspects of the alloy steel industry from ferro-alloys to the finished product. Particular interest was centered on questions involving ferro-alloy availability, stabilized stainless steels, the present status and future of the boron steels, slag and metal reactions in steelmaking and the induction stirring device for electric arc furnaces.

Prior to the question and answer period Harry F. Walther, panel chairman, who recently returned from a trip to Sweden, reviewed his impressions of the Swedish steel industry.

Zinc Die-Casting Industry Grows Steadily; Failures By Contamination Reduced

Reported by L. F. Janssen

John Deere Des Moines Works

The possibilities and limitations of die castings as produced by the Kiowa Corp. of Marshalltown, Iowa, were described before the Des Moines Chapter A.S.M. in March. Cecil J. Porter, chief engineer of the sand casting and die casting divisions of the Kiowa Corp., was the speaker.

The forerunner of die casting was the type-setting machine, first built in 1849, according to the speaker. Die casting as it is known today had its beginning in 1911. Since that time, it has grown steadily and today there are more than 750 die-casting organizations in the United States.

Zinc is widely used as a base metal for die castings because the over-all cost is low, the casting temperature is moderate (approximately 800° F.), when properly alloyed the physical properties are good, and inserts can readily be cast into the part. Alloying elements used in zinc-base alloys are aluminum, copper and magnesium.

Aluminum, varying in quantity from 3.5 to 4.3%, is added to reduce grain size and increase the strength, up to a tensile strength of 47,500 psi. in Zamak No. 5. The presence of aluminum reduces the attack of zinc on iron, permitting the use of the submerged gooseneck type of die-casting machine. Aluminum has the undesirable effect of reducing impact strength if more than 4.5% is present, Mr. Porter pointed out.

Addition of copper increases resistance to corrosion and increases tensile and impact strength. Zamak No. 5 contains from 0.75 to 1.25% copper, wheras Zamak No. 3 has 0.10% or less.

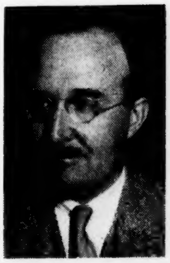
Magnesium is considered to be the "policeman" in zinc-base alloys, since its presence reduces the intergranular corrosive effects of impurities such as tin, lead and cadmium. The amount of magnesium used varies from 0.03 to 0.08%.

Improved inspection methods and closer control of alloying elements through the Certified Zinc Plan of the American Die Casting Institute assure the user of reduced failures due to contamination. Before the war, 50% of all failures resulted from contamination. That figure now stands at 10%.

A color film entitled "Die Casting", produced by New Jersey Zinc Co., was a fitting climax following the discussion period.

James H. Knapp, Organizer Of L. A. Chapter, Dies

One of the organizers and a past chairman of the Los Angeles Chapter A.S.M., James H. Knapp, industrial furnace engineer, died suddenly of a heart attack on April 1. He was 61 years old.



J. H. Knapp

Mr. Knapp was a graduate of Carnegie Institute of Technology, with a B.S. in Metallurgical Engineering. From graduation until 1922 he was with Tate Jones and Co., furnace engineers in Pittsburgh, becoming vice-president and general manager. In 1922 he moved to Los Angeles and organized the James H. Knapp Co. for the manufacture and sale of industrial heating furnaces.

Norman R. McKeen, formerly vice-president of Southern Counties Gas Co. of California, has been elected president of James H. Knapp Co., succeeding the founder.

Explains Metallurgy of Atomic Energy

Under the Banner at the Speakers' Table Are W. H. Keller of Mallinckrodt Chemical Co., H. A. Wilhelm, Associate Director of the Ames Laboratory, and Carl Messinger of Allegheny Ludlum Steel Corp., Chapter Chairman

Reported by G. A. Fisher, Jr.
International Nickel Co., Inc.

Some of the metallurgy involved and some of the practical applications of atomic energy were graphically explained by Harley A. Wilhelm, associate director of the Ames Laboratory of the Atomic Energy Commission, in a talk to the St. Louis Chapter A.S.M. on March 16.

Dr. Wilhelm exhibited specimens of normal uranium metal and thorium metal, and demonstrated the effect of gamma and beta rays from these metals on a Geiger counter. To show the effect that distance plays in the amount of effective radiation from radioactive sources, he used a small amount of radioactive cobalt which emits gamma rays equivalent to 1,300,000-volt rays. Uranium^{238} and thorium metal, Dr. Wilhelm explained, are converted by nuclear reactions to plutonium^{239} and uranium^{233} respectively. These two products together with uranium^{235} are our present fuels for use as sources of atomic energy.

Dr. Wilhelm used the potential energy available from a pound of coal as a yard stick. By dropping a pound of coal 6 ft., the power generated would be equivalent to about 8 watts for 1 sec. If this coal were burned in an efficient steam power plant approximately 4 kw-hr. of electrical energy would be developed. However, if this pound of coal or a pound of any material could be converted entirely to atomic energy, according to Einstein's equation, power would be developed sufficient to produce 12 billion kw-hr. of electrical energy. The atomic reactions now employed are only 0.1% efficient, which gives about 12 million kw-hr. equivalent of energy per pound of atomic fuel. This is the source of the large amount of energy associated with the atomic bomb.

Dr. Wilhelm clearly explained the structure of hydrogen, carbon and uranium atoms and showed how isotopes differ by the number of neutrons in the atomic nucleus. Uranium^{235}, which occurs in nature, merely needs to be concentrated for most effective use. The atomic chain reaction is generated when a free neutron bombards and splits an atom of uranium^{235}, uranium^{233} or plutonium and frees more neutrons which in turn propagate the chain to cause the release of atomic energy from practically all of the atoms in the charge.

Atomic fuel has both military and commercial applications, such as the generation of power for propulsion and the generation of electricity. Radioactive isotopes used primarily as tracers constitute one of the major projects of the Atomic Energy Commission and will perhaps become the most important development for mankind to come out of the entire atomic energy program, the speaker predicted in conclusion.

Ontario Hears W. E. Jominy

Reported by A. F. Mohri
Chief Metallurgist
Steel Co. of Canada, Ltd.

A.S.M. National President Walter Jominy addressed the Ontario Chapter A.S.M at St. Catherines on Dec. 1, 1950. The subject of his talk was "Alloy Steel From the Consumer's Standpoint". The president answered many questions in a gratifying discussion period at the conclusion of his highly informative talk.

NPA Offers Emergency Aid In Securing Lab Supplies

Emergency assistance in obtaining scientific instruments and laboratory apparatus in short supply or under allocation will be extended by the National Production Authority to university and other scientific laboratories, according to W. E. Mahin, director of the metallurgical projects division, Metallurgical Advisory Board, and A.S.M. representative on the National Research Council.

Such emergency assistance is designed to tide over the period until a new "controlled materials plan" will be in operation sometime around July first.

Specific requests for assistance in obtaining laboratory instruments and apparatus may be solicited by research and development laboratories contributing to the defense program or carrying on basic research in the interest of the national welfare. Requests should be addressed to the Technical Scientific Supplies Division of National Production Authority, Washington 25, D. C.

Castings of Various Metals Compared

Leaders at February Meeting of Worcester Chapter A.S.M.: Lincoln G. Shaw of Pratt & Inman, Secretary-Treasurer; Walter M. Saunders, Jr., Consulting Metallurgist, Who Spoke on "Casting Applications in Industry"; John R. Dobie of Wickwire-Spencer Steel Co., Technical Chairman; and Robert S. Morrow of George F. Blake, Inc., Chairman. Mr. Saunders' talk included a general comparison of the mechanical properties of steel, brass and bronze, aluminum, and iron, including gray iron, nodular iron and malleable iron. Typical castings were displayed to illustrate points in the talk. (Reported by C. Weston Russell, Wyman-Gordon Co.)

Past Chairmen and 25-Year Men Honored; President Speaks

Ten of the Texas Chapter's 12 Past Chairmen Were Honored at the Meeting on March 13. Significance was also added to the meeting by the presence of National President Walter E. Jominy and by the award of 25-year certificates to seven members. In the photograph are M. W. Phair, secretary-treasurer; Wade Hampton, Carl S. Cook and R. W. Schlumpf, all past chairmen and 25-year men; F. M. Wittlinger, past chairman; H. C. Dill, current vice-chairman; W. E. Jominy, national president; Harold Schmid, chairman; K. P. Campbell, Charles Shapiro, W. E. Burndrett, W. A. Kueneman and C. F. Lewis, past chairmen. Not shown are Past Chairmen R. M. Garrison, George G. Harrington and Glen R. Ingels. Mr. Jominy delivered the principal address, on "Alloy Steels From the Consumer's Standpoint". (Reported by P. H. White, B. F. Coombs Co.)

Fledgling Albuquerque Group Hears Gammeter

Reported by D. T. Doll
Los Alamos Scientific Laboratory

With the fledgling Albuquerque group of A.S.M. members acting as hosts, about ten members of the Los Alamos Chapter journeyed to that city for a most successful meeting on March 30. Speaker was A.S.M. National Trustee Elmer Gammeter of Globe Steel Tubes Co.

Mr. Gammeter prefaced his talk on "Stainless Steels" with a few historical remarks, and then described the effect of a number of elements in their tendencies to form ferrite or austenite. The speaker used slides to show the phase equilibria for chromium and iron, and the effects of nickel and carbon on the transformations.

Mr. Gammeter characterized the family of stainless steels by classifying them as ferritic, martensitic or austenitic. Each group was described as to salient features and general industrial usage.

The speaker concluded his discussion with an interesting appraisal of failures, including details as to cause and prevention. Inadequate consideration of the metallurgical fundamentals involved is the principal reason for both misapplication and improper fabricating and processing.

The question period was conducted by Gerhard F. Heckman of Albuquerque, who served as technical chairman and also introduced the speaker.

DON'T MISS—
World Metallurgical Congress
National Metal Congress
National Metal Exposition
Detroit—Oct. 15 to 19, 1951

Magnetic Materials Indianapolis Subject

William Higburg (Center) Receives a 25-Year Certificate From Past President Arthur E. Focke at the February Meeting of the Indianapolis Chapter. Left is John Mitchell of Indianapolis Naval Ordnance Plant, chapter chairman; and next to Mr. Higburg are Laurence C. Hicks of Allegheny Ludlum Steel Corp., who spoke on recent developments in magnetic core materials, and Arnold Nelson, also of Allegheny Ludlum

Reported by John C. Wagner
Head, Metallurgical Branch
Research and Test Department
Indianapolis Naval Ordnance Plant

On Feb. 19, Laurence C. Hicks, director of research, Allegheny Ludlum Steel Corp., entertained the Indianapolis Chapter A.S.M. with an interesting discussion of "Recent Developments in Magnetic Core Materials", covering the Permalloy and Mumetal types, as well as the newer "supermalloy".

Using Kodachrome slides, Dr. Hicks explained the various terms and concepts of ferromagnetism, including magnetizing force, induction and permeability. The use of magnetization curves to represent the relationship of these properties was illustrated, along with typical curves for various magnetic materials ranging from silicon-iron to high permeability nickel-iron alloys.

The concept of core loss was explained and various materials were compared. The speaker showed the effects of specific resistance, hysteresis loss, lamination thickness, and interlamination resistance on total core loss.

Recent developments in the use of highly oriented magnetic materials were discussed, considering oriented silicon-irons as well as the newer oriented nickel-irons. The latter are characterized by sharply rectangular hysteresis loops with special applications to chokes for contact rectifiers, pulse transformers, and magnetic amplifiers.

Recent work on cobalt-iron alloys subjected to annealing in a magnetic field was briefly considered.

Materials Evaluated For Induction Heating

Reported by George H. Thurston
Metallurgist, Benicia Arsenal

Golden Gate's own Roger Dexter, president of Dexter Metal Treating Co., treated the chapter members to a valuable talk on "Induction Heat" on Jan. 16. The method has proven very useful to local industries, he said, particularly for small quantity production.

The three principal types of induction heating units are the motor-generator, spark gap and radio oscillator tube. Mr. Dexter described the frequency characterizations and named the principal makes of each type.

Local uses of the induction method on a variety of sizes and kinds of parts were illustrated with slides. Coil design was pictured and explained, and the adaptability of the apparatus in handling many different sorts of jobs was emphasized.

Mr. Dexter evaluated materials with respect to their suitability for induction treatment and gave examples of hardening, annealing and brazing operations. Medium-carbon steels are prone to crack in hardening, he stated, unless hardenability characteristics are known and understood. Manganese steels are less susceptible to cracking, and Cr-Mo steels are still better because intricate shapes can be oil quenched. Low-carbon free-machining steels can be carburized and successfully induction hardened when only certain areas require hardness. One exception to the general rule that highly alloyed steels are not properly hardened by induction heating is a needle valve stem or similar very small parts.

Advantages of the method are the precise hardening pattern permissible, freedom from warpage and scale, high speed and low cost. Large numbers of small parts which could be satisfactorily treated by other methods except for warpage, are induction hardened purely to eliminate this condition. Locally produced parts were exhibited to illustrate the speaker's remarks.

Chicago Has President's Night

Head Table for National President's Night of the Chicago Chapter A.S.M. Included C. T. Prendergast of Western Electric Co., Program Chairman; W. E. Mahin of Armour Research Foundation, Chapter Chairman; A. S. M. President W. E. Jominy, Who Spoke on "Hardenability of Steel—Present Status"; L. E. Simon of Electro-Motive Div., G. M. C., Technical Chairman; and J. W. Queen of Jos. T. Ryerson and Son, Inc., Member of the Executive Committee. (Reported by Thomas S. Simms, John Crerar Library)

Salt Bath Brazing Attains Tolerances of 0.001 In.

Reported by John C. Wagner
Head, Metallurgical Branch, Research and Test Department Indianapolis Naval Ordnance Plant

On March 19 A. F. Holden, president of A. F. Holden Co., addressed the Indianapolis Chapter on "Salt Bath Brazing". Things got off to a good start when the speaker presented the audience with copies of the outline of his talk, a practice that was welcomed by everyone present.

Mr. Holden then went on to explain that fluxing must be used for the brazing of silver, brass, and bronze. Copper, however, is brazed at considerably higher temperatures and fluxing is not necessary, since good adherence is obtained between the copper and the steel parts being joined. In fact, whenever brazing is performed above approximately 2000° F., no flux should be necessary. Tolerances for good brazing of each of the above materials approximate 0.001 to 0.002 in.

When fluxing is used, it might be thought that the flux will contaminate the bath. However, this is not true, since the quantity of flux amounts to only a fraction of the bath.

A question was raised by the audience concerning the effect of quenching upon a brazed joint. The joint is frozen prior to the quench, Mr. Holden explained, and the ductility of the brazed joint prevents the formation of cracks. An obvious advantage of brazed joints is that decarburization and scaling are prevented.

At the conclusion of his talk, Mr. Holden was greeted with a barrage of questions so numerous that it was necessary for him to remain for quite some time after the chairman closed the meeting.

John Parina Added to A.S.M. Staff as Associate Editor of Metal Progress

The post of associate editor of *Metal Progress* has been filled by the appointment of John Parina to take over the duties formerly handled by Taylor Lyman. Dr. Lyman was named publisher of the magazine in January 1951.

Mr. Parina attended Fenn College in Cleveland, where he majored in metallurgical engineering. His first position was with American Steel & Wire Co., starting in 1937. After working in the plant for one year, he was transferred to the chemical laboratory at the Cuyahoga Works, then to the general metallurgical control laboratory, and subsequently did development work on electrical grade steel.

In 1945 he joined Penton Publishing Co. as assistant editor, and was made associate editor in 1946.

Following this editorial experience, he turned to publicity work as advertising copywriter for Warner & Swasey Co. and later with Baker Raulang Co. in advertising, publicity, and sales promotion.

This combination of plant and laboratory experience, editorial and advertising capacities gives Mr. Parina an admirable background for handling diverse editorial duties on *Metal Progress*, where he will be associated with Ernest E. Thum, editor since the magazine's inception in 1930.

THIRTY YEARS AGO

Headline in the April 1921 issue of *Transactions:* "Philadelphia Chapter Holds Biggest Meeting Since Its Organization". Designated by National President A. E. WHITE "without question the leading chapter of the American Society for Steel Treating", Philadelphia at that time boasted a membership close to the 300 mark (present total 831).

— 30 —

PRESIDENT WHITE went on to point out the healthy financial condition of the national society. While assets at that time totaled a mere $2200, ". . . .you belong to a society that is absolutely free from debt," he said ". . .and there will be absolutely no necessity for raising the dues or asking for special subscriptions from any of you." A.S.M. is proud to boast that in the intervening 30 years it has never been necessary to revise that statement.

— 30 —

At this same Philadelphia Chapter meeting a prophetic statement was made by JOSEPH W. RICHARDS,† professor of metallurgy at Lehigh University. "If we could take X-ray pictures right through iron," he predicted, "they would reveal its internal structure, blowholes and nonmetallic inclusions. General Electric Co. is now working on this problem."

— 30 —

New officers unanimously elected by the Washington Chapter were: chairman—SAM TOUR, Ordnance Department (now president of Sam Tour & Co., New York); vice-chairman—W. L. BLANKENSHIP†, Navy Department; secretary-treasurer—H. J. FRENCH, Bureau of Standards (now vice-president of International Nickel Co., Inc., and an A.S.M. past president).

— 30 —

Listed among the new members in April 1921 was F. P. ZIMMERLI of Solvay Process Co., Detroit. Mr. Zimmerli is now best known as a spring expert (chief engineer, Barnes Gibson Raymond), whose accomplishments in this field won him the Sauveur Achievement Award in 1948.

— 30 —

Under "Commercial Items of Interest" in the April 1921 issue of *Transactions* appears a description of a new "Rockwell direct-reading hardness tester" put on the market by WILSON MAEULEN CO. The first of these instruments to be manufactured was delivered to John Royle and Son, Paterson, N. J., on June 14, 1921. The same instrument is now on display in the Sauveur Memorial Museum at A.S.M. headquarters, gift of Wilson Mechanical Instrument Co.

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† Deceased.

Substitutes Help Solve Alloying Problems

R. D. Stout of Lehigh University, Technical Chairman of the March Meeting; A. B. Kinzel, Who Spoke on "Effects of Alloying Additions to Steel"; and J. F. Libsch, Chairman of the Lehigh Valley Chapter

Reported by Frank H. Laxar
Instructor in Metallurgy
Lehigh University

In the engineering steels the primary purpose of alloying elements is to improve hardenability. Grossmann's important discovery that small amounts of several elements have a greater effect on hardenability than the same total amount of any one led to the National Emergency Steels of World War II, resulting in the best use of our short supplies of alloying elements.

Speaking on "Effects of Alloying Additions to Steel", A. B. Kinzel, president of Union Carbide and Carbon Research Laboratories, Inc., and vice-president of the Electro Metallurgical Co., cited the principal criterion for developing substitute steels for use in emergencies. Primary consideration must be given, he said, to what alloying elements are available, practically regardless of cost.

The compositions of the new 8000 series steels were decided upon by calculating hardenability. They were designed to make use of the residual Cr, Ni, and Mo in scrap with minimum additions of other elements. Among the added elements is boron, with vanadium now under study.

Vanadium is also useful in high speed steels. When added alone it decreases hardness because it ties up more carbon in the carbide phase. However, if carbon is added along with the vanadium, improved properties result, the maximum amount of vanadium plus carbon being limited by the requirements of hot workability.

Vanadium can be used in the structural as-rolled steels where high ductility is important. Killed steels have been the only types with the necessary properties in this field, but by adding vanadium the desired qualities can be developed in semi-killed steels, eliminating the need for hot-topping.

Columbium, which is now in critically short supply, is used to improve the corrosion resistance of stainless steels and the high-temperature strength of bucket and wheel alloys for jet engines. Tantalum is as good as columbium for use in the high-temperature alloys but somewhat less effective in stainless steels. Unfortunately, it, too, is very scarce but it has made possible the 2 to 1 Fe-Cb-Ta alloys. If carbon is kept below 0.03%, the need for columbium or tantalum in stainless for use at room temperature is eliminated. This is a real steelmaking achievement, made possible by the use of low carbon ferro-alloys and by careful slag control.

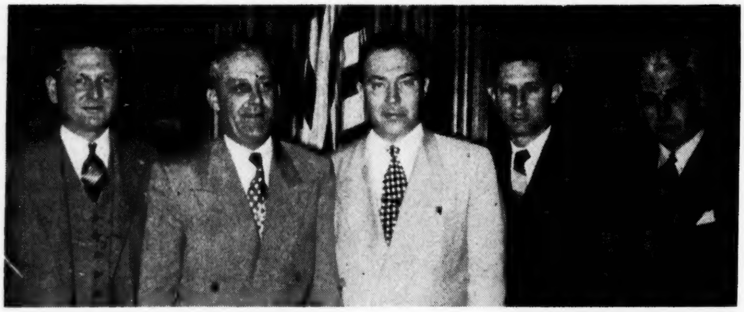
Dr. Kinzel concluded his talk with a discussion of the low-alloy Cr-Cu-Ni steels with 0.12% carbon and with aluminum for fine grain size which have a transition temperature at −80°C. or lower. The transition temperature correlates with the ability of a steel to undergo plastic deformation under adverse stress systems. Because of this, Dr. Kinzel stated that the factor of safety should be a function of the plasticity of the steel rather than of its tensile strength.

Prior to the technical meeting the Pittsburgh Players, six outstanding actors (and metallurgists), gave their amusing production of "Fifty Years of Metallurgy".

Timken Announces Expansion

Timken Roller Bearing Co., Canton, Ohio, has announced a five-million-dollar expansion program that will involve both melting and fabricating facilities for increased steel production. The program will include new land and buildings, three top-charge 80-ton electric furnaces, additional soaking pit facilities, and related items. In the fabricating end, the expansion will cover rearrangement of the tube mill for additional equipment and a new cold tube reducer and annealing furnace.

Tool and Die Welding Reviewed



Frank E. Kessler (Second From Left), Field Engineer, Welding Equipment and Supply Co., Detroit, Spoke on "Tool and Die Salvage by Welding" at the March 14th Meeting of Worcester Chapter A. S.M. Left to right are: Robert S. Morrow of George F. Blake, Inc., chapter chairman; Mr. Kessler; Pat Doyen of Welding Equipment and Supply Co.; P. L. Edmonds of Arcos Co.; and Herbert D. Berry of Thomas Smith Co., chairman of the Worcester Chapter Educational Committee. (Reported by C. Weston Russell)

IMPORTANT MEETINGS *for June*

June 3-8 — Society of Automotive Engineers. Summer Meeting, French Lick Springs Hotel, French Lick, Ind. (John A. C. Warner, secretary and general manager, S.A.E., 29 West 39th St., New York 18).

June 4-6—American Gear Manufacturers Association. Annual Meeting, The Homestead, Hot Springs, Va. (Newbold C. Goin, executive secretary, A.G.M.A., Empire Bldg., Pittsburgh 22.)

June 11-15 — American Society of Mechanical Engineers. Spring Meeting, Royal York Hotel, Toronto. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18.)

June 11-13—Electric Metal Makers Guild, Inc. 19th Annual Meeting, Seigniory Club, Montebello, Que., Canada. (R. J. McCurdy, secretary, E.M.M.G., Box 6026, Mt. Washington Sta., Pittsburgh 11.)

June 11-13—Armour Research Foundation. Symposium on Analysis and Metallography of Titanium, Sheraton Hotel, Chicago. (Julian Glasser and Max Hansen, co-chairmen, c/o Armour Research Foundation, Illinois Institute of Technology, Technology Center, Chicago 16.)

June 14-16—Armour Research Foundation. Symposium on Surfaces, Sheraton Hotel, Chicago. (Charles F. Tufts and Walter C. McCrone, co-chairmen, c/o Armour Research Foundation, Illinois Institute of Technology, Technology Center, Chicago 16.)

June 18-22—American Society for Testing Materials. 54th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. (Robert J. Painter, assistant secretary, A.S.T.M., 1916 Race St., Philadelphia 3.)

June 21-22—Malleable Founders Society. Annual Meeting, The Homestead, Hot Springs, Va. (Lowell D. Ryan, managing director, M.F.S., 1800 Union Commerce Bldg., Cleveland 14.)

June 24-26—Alloy Casting Institute. Annual Meeting, The Homestead, Hot Springs, Va. (E. A. Schoefer, executive secretary, A.C.I., 32 Third Ave., Mineola, N. Y.)

June 25-29—American Institute of Electrical Engineers. Summer General Meeting, Royal York Hotel, Toronto. (H. H. Henline, secretary, A.I.E.E., 33 West 39th St., New York 18.)

June 25-28—American Electroplaters' Society. Annual Meeting, Hotel Biltmore, Los Angeles. (A. Kenneth Graham, executive secretary, A.E.S., 473 York Rd., Jenkintown, Pa.)

June 27-28—Institute of the Aeronautical Sciences. Annual Summer Meeting, I.A.S. Western Headquarters Bldg., 7660 Beverly Blvd., Los Angeles. (R. R. Dexter, secretary, I.A.S., 2 East 64th St., New York 21.)

Columbus Lecture Course Statistics Prove Gratifying

Statistical data on the recently completed educational course sponsored by the Columbus Chapter A.S.M. indicate its unqualified success. The course consisted of four lectures on the "Fundamentals of Heat Treatment". Attendance at these four lectures ranged from 203 to 228, with 209 persons attending three out of the four lectures. Certificates attesting to 100% attendance at all four lectures were awarded to 169 of those registered.

Arthur R. Elsea of Battelle Memorial Institute is chairman of the Educational Committee. The lecturers were J. W. Spretnak of Ohio State University, G. K. Manning of Battelle, R. E. Christin of Columbus Bolt and Forging Co., and C. S. Thomas of Jeffrey Mfg. Co.

British Columbia Chapter Has First Ladies' Night

Reported by Wm. Galt
Plant Superintendent
Canadian Sumner Iron Works, Ltd.

Under the tall, silent sentinels of giant Stanley Park firs glistening under a tinsel-like mantel of freshly fallen snow, the first Ladies' Night social evening of the British Columbia Chapter A.S.M. was held on March 8.

Prof. Ellis H. Morrow, late of the University of B.C. Department of Economics and Commerce, was guest speaker, and compared the history of our times to that of the Napoleonic era in a manner which showed a keen insight into present and past economic affairs.

Following Professor Morrow's talk, two highly entertaining films donated by one of the sustaining members, the B.C. Electric Railway Co., Ltd., were shown under the able direction of D. Butler. The films showed the installation of the third generating unit at Bridge River, and some of the gardens in Victoria and in Vancouver.

One of the special features of the evening was the award of a handsome door prize donated by Marshall Wells B.C. Ltd., another sustaining member. This prize, a beautiful automatic toaster, was won by Mrs. W. O. Scott.

Prof. W. M. Armstrong, of U.B.C. Department of Mining and Metallurgy, presided, while Frank Cazalet of B.C.E.R. introduced and thanked the speaker.

E. L. Spanagel Promoted by Rochester Gas and Electric

E. L. Spanagel

Edmund L. Spanagel, a past national treasurer of the American Society for Metals, has been promoted from engineer in the industrial department to assistant manager of the commercial and industrial sales department of Rochester Gas & Electric Corp. Mr. Spanagel has been associated with Rochester Gas and Electric since his graduation from University of Michigan in 1919 with a degree in electrical engineering.

Long active in the Rochester Chapter A.S.M. (secretary-treasurer for eight years, then successively vice-chairman and chairman), Mr. Spanagel was A.S.M. national treasurer in 1948-49.

Steel Carburization Explained as Two Major Processes

Reported by Knox A. Powell
Research Engineer
Minneapolis-Moline Co.

Carburization of steel involves two major processes, explained John Welchner, metallurgical engineer of the Timken Roller Bearing, in an illustrated talk on carburizing before the Northwest Chapter A.S.M. at its regular monthly meeting in March.

These two processes are the transfer of carbon from carbon monoxide or other carbonaceous gas to the steel under favorable conditions of concentration and temperature, and the migration of the carbon from the surface of the steel under similar favorable temperature conditions.

Carbon transfers to iron most readily when the iron is in the austenitic state; hence, carburizing temperatures are always above the upper critical. The elevated temperature, said Mr. Welchner, also favors the carbon migration.

The transfer of carbon to iron is, moreover, controlled by the relative amounts of carbonaceous gases present in the atmosphere. Thus, the rate of carbon transfer and the equilibrium carbon concentration in the work are controlled not only by the concentration of the carbonaceous gas, but also by the presence and concentration of other gases, such as water vapor in Rx gas carburizing.

The beneficial results of carburizing depend particularly upon the handling after carbon absorption is complete, Mr. Welchner indicated. Distortion is increased by repeated heating and cooling; hence the practice of quenching from the carburizing heat, particularly with modern fine-grained steels which do not coarsen unduly at carburizing temperatures. Surface carbon control and sometimes cold treatment, help in promoting austenitic transformation to improve strength and/or wearability.

Certain combinations of differential temperature and of volumetric changes result in surface compression in carburized parts that opposes the externally applied stresses, while other combinations result in tension that favors fatigue breakage. These conditions, said Mr. Welchner, are the subject of a projected long-time study at Timken laboratories. Incidentally, Timken has developed an accurate laboratory method of determining the depth of carburizing to any given carbon concentration.

The meeting closed with a lively discussion of the methods of carbon transfer and the wear and strength values of various carbon concentrations and heat treat structures. The cause and prevention of subsurface fatigue was also brought up.

Compressive Stresses Used To Improve Fatigue Life

Reported by Fred K. Landecker
Metal Improvement Co.

"Some New Concepts of Fatigue of Metals" were presented before the Los Angeles chapter A.S.M. at a joint meeting with the A.I.M.E. by J. O. Almen, research consultant, General Motors Corp.

Laboratory tests checking the fatigue life of metals are often misinterpreted because they do not duplicate the stress-cycle of the part in service, Mr. Almen asserted.

He showed many slides illustrating that a crack can neither start in nor progress into a compression layer. Processes such as nitriding, carburizing, shot peening and surface rolling set up high residual compressive stresses and thus will produce tremendous increases in fatigue life.

The harmful effects of chromium plating can likewise be overcome by providing for compressive stresses. The plated layer is stressed in tension and therefore develops cracks. If the surface of the base metal is in compression the cracks cannot propagate into it and are quite harmless. Mr. Almen also told of a method to apply nickel plate with the surface in compression.

Safer Now to Buy Alloys on Hardenability

The defense program requires conservation of strategic metals—so, as in the last war, alloy steel analyses are changing. Some standard alloys are still available. But many new, or interim, analyses are already on the market. Others are on the way.

Today more than ever, under these changing conditions, the safest way to buy alloys is on the basis of analysis *and* hardenability rather than on analysis alone. When we know the hardness or tensile strength you need, we make absolutely sure that the alloy you receive meets your requirements—even though it will be many months before standard hardenability ranges of the new steels are established. Here is how we do it:

We carefully test each and every heat of as-rolled and annealed alloy steel in our stocks. This gives us actual knowledge of the hardenability of every bar of Ryerson alloy. Thus when you specify on a hardenability basis you can be sure the alloy you get from Ryerson will meet your requirements. And you can also be sure of getting the desired heat treatment results because the test information and other helpful data to guide you come with the steel.

Not every company makes these tests, records this information, but Ryerson does—and at no extra cost to you. It's all part of a service system called the Ryerson Certified Steel Plan. So during this confusing period, order by AISI and SAE number if you wish but also specify hardenability and be doubly sure. Though some shortages are inevitable, we will do our level best to supply the alloy steel you need.

PRINCIPAL PRODUCTS

ALLOYS—Hot rolled, cold finished, heat treated. Also tool steel

CARBON STEEL BARS—Hot rolled and cold finished

STRUCTURALS—Channels, angles, beams etc.

PLATES—Many types including Inland 4-Way Safety Plate

SHEETS—Hot and cold rolled, many types and coatings

TUBING—Seamless and welded, mechanical and boiler tubes

STAINLESS—Allegheny bars, plates, sheets, tubes, etc.

BABBITT—Five grades, also Ryertex plastic bearings

MACHINERY & TOOLS — For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS LOS ANGELES • SAN FRANCISCO

6th METALLOGRAPHIC EXHIBIT

Rules are simple and few; there are no restrictions as to size or method of mounting, except for entries from overseas. As in the five previous exhibits, the entries will be displayed to good advantage.

CLASSIFICATION OF MICROS

- Cast irons and cast steels
- Toolsteels (except carbides)
- Irons and alloy steels (excluding stainless) in wrought condition
- Stainless and heat resisting steels and alloys
- Light metals and alloys
- Heavy nonferrous metals and alloys
- Powder metals (and carbides) and compacts
- Weld structures (including brazed and similar joints)
- Series of micros showing transitions or changes during processing
- Surface phenomena
- Macrographs of metallurgical objects (2 to 10 diam.)
- Results by non-optical or unconventional techniques

RULES FOR ENTRANTS

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable.

Photographic prints shall be mounted on stiff cardboard, each on a separate mount, each carrying a label giving:

Name of metallographer
Classification of entry
Material, etchant, magnification
Any special information as desired

Transparencies or other items to be viewed by transmitted light must be mounted on light-tight boxes wired for plugging into lighting circuit, and built so they can be fixed to the wall.

Exhibits must be delivered between Sept. 20 and Oct. 10, 1951, either by prepaid express, registered parcel post, or first-class letter mail.

Address: Metallographic Exhibit
National Metal Congress and Exposition
State Fair Grounds
Woodward & State Fair Ave., Detroit, Mich.

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence.

A Grand Prize, in the form of an engrossed certificate, and a money award of $100 will be awarded the exhibitor whose work is adjudged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's headquarters.

All other exhibits will be returned to owners by prepaid express or registered parcel post during the week of Oct. 22, 1951.

Entrants living outside the U.S.A. will do well to send their micrographs by first-class letter mail endorsed "May be opened for customs inspection before delivery to addressee". To meet regulations of the international mails, size of mount must be no larger than 14 x 18 in.

WORLD METALLURGICAL CONGRESS
33rd NATIONAL METAL CONGRESS AND EXPOSITION

DETROIT, MICH. ***OCTOBER 15 TO 19, 1951***

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
W. W. Howell, Technical Abstractor
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A GENERAL METALLURGICAL

114-A. Western Metalworking Appraisal and Forecast. *Western Metals*, v. 9, Mar. 1951, p. 27-40.
Economic and technological status and prospects. Section on "Production" consists of the following: "Basic Steel," Walther Mathesius; "Steel Fabrication," E. F. Gohl; "Steel Pipe," Jack L. Ashby; "Merchant Steel—Plates—Sheets," Alden G. Roach; "Aluminum," C. S. Thayer. Section on "Processing" consists of the following: "The Machine Shop," J. C. Axelson; "The Foundry," Carleton B. Tibbets; "The Forge," W. A. DeRidder. Section on "Manufacture" consists of the following: "Aircraft," Leland D. Webb; "Automotive," Charles E. Walls; "Fasteners," Price Berrien; "Agricultural Machinery," E. E. Houston; "Oil Tools," E. S. Dulin; "Domestic Appliances," W. J. Bailey, Jr. (A4)

115-A. Mobile Drum Factory Takes the Work to the Job. *Sheet Metal Industries*, v. 28, Mar. 1951, p. 234-239.
British "factory" housed in truck trailers. Operations include rolling, forming, trimming, welding, and finishing. (A5, CN)

116-A. New Precipitation Plant at Butte. A. C. Bigley, F. F. Frick, M. McCanna, and J. P. Ryan. *Mining Congress Journal*, v. 37, Mar. 1951, p. 48-53.
How Anaconda recovers copper from mine water in the Butte mines. Cu and Fe sulfides are oxidized, with formation of $CuSO_4$, $FeSO_4$, and insoluble basic iron sulfates. These, together with more or less ore slime, are found in the mine water. In the precipitation process, the principal reaction is precipitation of metallic Cu by reaction of $CuSO_4$ with ferrous scrap. (A8, Cu)

117-A. Neutralizing Industrial Waste Liquids. *Steel*, v. 128, Apr. 9, 1951, p. 74-77, 95, 98, 101, 104, 108, 111-112.
Survey of accepted chemical treatments for pickle liquors, soluble oil mixtures and plating-tank effluents shows progress in minimizing pollution effects. (A8)

118-A. World Mining Developments in 1950. George O. Argall, Jr. *Mines Magazine*, v. 41, Mar. 1951, p. 35-38.
Includes brief report on Russia's mineral position and her metal and mineral gains as of 1950. Considers significant development in the "free-world" and analyzes what can be and is being done to offset our worsening mineral position. (A4, B10)

119-A. Treatment and Disposal of Plating Wastes. J. E. Cooper. *Sewage and Industrial Wastes*, v. 23, Mar. 1951, p. 295-306; disc. p. 307-308; *Plating*, v. 38, Apr. 1951, p. 346-352, 357.
Sources of plating wastes, disposal methods, suggested modifications in plating-room design, and various methods for cyanide treatment and disposal. Information on the Willow Run bomber plant and on Ford's new Monroe, Mich., plant. 27 ref. (A8, L17)

120-A. Steel for the Expanding Industry of California. Alden G. Roach. *American Iron and Steel Institute*, "Technical Committee Activities," 1950, p. 121-132.
Previously abstracted from *Blast Furnace and Steel Plant*. See item 58-A, 1951. (A4, A6)

121-A. The Pacific Northwest and Its Potentialities. H. H. Fuller. *American Iron and Steel Institute*, "Technical Committee Activities," 1950, p. 133-139.
Covers Oregon, Washington, Idaho, and Montana. Resources, industrial development, steelmaking, and transportation. (A4, ST)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

122-A. The Steel Plant Laboratory, Its Function and Value. Stephen Bianco. *American Iron and Steel Institute*, "Technical Committee Activities," 1950, p. 141-149.
Function of the laboratory from raw materials through melting practice, deoxidation, chemical analysis, mill practice, and mechanical-property tests to final inspection. (A9, S general, ST)

123-A. Steel for Western Needs. John R. Zadra. *American Iron and Steel Institute*, "Technical Committee Activities," 1950, p. 151-158.
Origin of the Western steel industry and its development. (A4, ST)

124-A. The European Steel Situation. Clarence B. Randall. *American Iron and Steel Institute*, "Technical Committee Activities," 1950, p. 175-183.
Steel practices and production, raw materials, rationing, and scrap. The Schuman plan to pool all of the coke and steel producers of Europe and its possible effects in Europe and the U. S. (A4, ST)

125-A. Air Pollution Abatement in the Steel Industry. C. A. Bishop. *American Iron and Steel Institute*, "Technical Committee Activities," 1950, p. 245-261.
Air-pollution-abatement requirements for the steel industry as set forth in the Smoke Control Ordinance of Allegheny County, Pa., with emphasis on progress made in studying the openhearth, bessemer, and blast-furnace problem. (A7, D general, ST)

126-A. Mineral Resources of Japan Proper 1925-1945 (A Preliminary Report). *General Headquarters Supreme Commander for the Allied Powers (Tokyo), Natural Resources Section*, Report 44, 1946, 161 pages.
Covers abrasives, Al, Sb, As, asbestos, barite, Bi, Cd, cement, chromite, clay, Co, Cu, dolomite, fluorspar, Au, Ag, graphite, gypsum, iron, steel, limestone, lime, Mg, Mn, mica, Mo, Ni, phosphates, platinum-group metals, quicksilver, the salt industry, sand, gravel, silica, stone, sulfur, pyrites, talc, pyrophyllite, Sn, Ti, W, V, Zn, and Pb. (A4, B10)

127-A. Cobalt Resources in Japan. General Headquarters. *Supreme Commander for the Allied Powers, Natural Resources Section.* (Tokyo), Report 54, Aug. 31, 1946, 23 pages.
Four individual mines. Data on production and reserves. (A4, B10, Co)

128-A. Nickel Deposits in Japan. T. G. Andrews, compiler. *General Headquarters Supreme Commander for the Allied Powers* (Tokyo), *Natural Resources Section*, Report 57, Sept. 30, 1946, 22 pages.
Individual mines. 23 ref. (A4, B10, Ni)

129-A. Tungsten and Molybdenum Metallurgy of Japan. *General Headquarters Supreme Commander for the Allied Powers* (Tokyo), *Natural Resources Section*, Report 61, 1946, 33 pages.
Sources of raw materials, production, and uses. Describes beneficiation practices. (A4, B10, B14, W, Mo)

130-A. Tungsten Resources of Japan. M. R. Klepper. *General Headquarters Supreme Commander for the Allied Powers* (Tokyo), Natural Resources Section, Report 77, Apr. 29, 1947, 31 pages.
Production and imports of tungsten, 1910-1945. Describes 8 individual mines. (A4, B10, W)

131-A. Mineral Resources of Southern Korea. *General Headquarters Supreme Commander for the Allied Powers* (Tokyo), *Natural Resources Section*, Report 84, July 28, 1947, 52 pages.
Alunite, arsenic, asbestos, beryl, coal, cobalt, copper, fluorite, gold, graphite, iron, lead, zinc, lithium, molybdenum, pyrophyllite, rare-element minerals, tungsten, and miscellaneous metals. (A4, B10)

132-A. Antimony Resources of Japan. *General Headquarters Supreme Commander for the Allied Powers* (Tokyo), *Natural Resources Section*, Report 92, 1947, 67 pages.
Domestic production and economy and foreign trade. Describes individual mines. 69 ref. (A4, B10, Sb)

133-A. Zinc Metallurgy in Japan. *General Headquarters Supreme Commander for the Allied Powers (Tokyo), Natural Resources Section,* Report 96, 1947, 56 pages.

Wartime allocations, specifications, prices, production costs, raw materials, and recovery processes. Includes tables and flow sheets. 18 ref. (A4, C general, Zn)

134-A. Iron Sand Resources of Japan. *General Headquarters Supreme Commander for the Allied Powers (Tokyo), Natural Resources Section,* Report 98, 1947, 32 pages.

Geographic distribution, production, stockpiles, prices, reserves, and geology. Describes mines, mining, milling, and metallurgical problems. 21 ref. (A4, B10, Fe)

135-A. Metallurgical Plants of Japan. *General Headquarters Supreme Commander for the Allied Powers (Tokyo), Natural Resources Section,* Report 137, 1950, 74 pages.

Locations and capacities of iron, steel, copper, lead, and zinc metallurgical plants in Japan. Includes all plants existing during the peak production years just before World War II. (A4, Cu, Fe, Pb, Zn, ST)

136-A. The Industrial Economics of Metallurgy. A. J. Murphy. *Engineer,* v. 191, Mar. 16, 1951, p. 343-345. (A condensation.)

Institute of Metals Presidential address. Present economic status and future prospects. Possible use of substitutes among the nonferrous metals. (A4, EG-a)

137-A. Evaluation of Industrial Wastes in Metal Processing Industries. David Milne. *Metal Finishing,* v. 48, Dec. 1950, p. 52-55, 76; v. 49, Jan. 1951, p. 65-69, 71.

The various waste liquids discharged during metal processing; ingredients considered injurious; degree of treatment necessary; methods commonly used for eliminating the objectionable character of the waste. 30 ref. (A8)

138-A. Steel Profits, Taxes, Sales Reach New Highs. John Delaney. *Iron Age,* v. 167, Apr. 12, 1951, p. 126, plus folded chart.

Financial data for 26 chief steel producers of the U. S., giving comparative figures for each for 1949 and 1950. These companies possess 92% of U. S. ingot capacity as of Jan. 1, 1951. (A4, Fe, ST)

139-A. Scrap: Industry's 5 Percenter. *Modern Industry,* v. 21, Apr. 15, 1951, p. 52-55.

Organization for more efficient scrap recovery. Typical examples of good systems. In most cases, large economic benefits are possible. (A8)

140-A. Where Did 1950's Steel Go? Here's the Breakdown. *Steel,* v. 128, Apr. 16, 1951, p. 54-55.

Tabular breakdown by metal form and by industry or end use. (A4, ST)

141-A. (Book) **Technical Committee Activities.** 261 pages. 1950. American Iron and Steel Institute, 350 Fifth Ave., New York 1.

Contains addresses presented at regional technical meetings throughout 1950. Pertinent ones are abstracted separately. (A general, D general, ST)

142-A. (Book) **De Re Metallica.** Georgius Agricola. (Translated by Herbert Hoover and Lou Henry Hoover). 672 pages. Reprinted 1950. Dover Publications, Inc., 1780 Broadway at 57th St., New York 19. $10.00.

Originally published in 1556 and translated by the Hoovers in 1912. It was the only authoritative text on the production of metals for almost 200 years and is still read for general scientific interest as well as its historical importance. (A2)

143-A. (Book) **The Behavior of Engineering Metals.** H. W. Gillett. 395 pages. 1951. John Wiley & Sons, 440 Fourth Ave., New York 18. $6.50.

Written for non-metallurgists, who must select metals and alloys for engineering uses. Metallurgical terminology, mechanical tests, properties, specifications, and detailed features of various steels, alloys, and other metals. Includes discussion of coatings, corrosion, and powder metallurgy. Chapter bibliographies. (A general)

144-A. (Book) **Industrial Plant Location. Its Application to Zinc Smelting.** Carl Hayden Cotterill. 155 pages. 1950. American Zinc, Lead & Smelting Co., 1600 Paul Brown Bldg., St. Louis 1, Mo. $5.00.

Factors considered are raw materials, labor, power and fuel, market area, transportation, capital sources, laws and taxes, technological requirements, all in their geographical variations. Shows how to determine the ideal location for a zinc smelter after weighing all the above factors. A case study demonstrates application of the principles. (A4, C21, Zn)

145-A. (Book) **F.B.I. Register of British Manufacturers.** Ed. 23. 852 pages. Nov. 1950. Kelly's Directories, Ltd., and Iliffe and Sons, Ltd., Dorset House, Stamford St., London S.E. 1, England. 42 s.

Provides a substantial cross-section of the most important producers of British goods in a wide range of industry. Compiled and classified for quick reference with major instructions and cross-references in English, French, and Spanish. Comprises 7 sections: a classified Buyer's Guide listing over 6,000 F.B.I. member firms under alphabetical trade headings; advertisements; addresses; trade associations; brands and trade names; trade marks; and addenda. (A10)

146-A. (Book) **L'Industrie Sidérurgique dans le Monde et son Evolution Economique depuis la Seconde Guerre Mondiale.** (The Iron and Steel Industry of the World and its Evolution Since the Second World War). 398 pages. Presses Universitaires de France, 108 Blvd. St.-Germain, Paris, France. 500 fr.

An economic study of the present status of the industry in each of the important producing countries. Resources, plants, programs, and potentialities of the industry, both in Iron Curtain countries and elsewhere. The problems of German industry. (A4, Fe, ST)

147-A. (Book) **Metalli Non-Ferrosi e Ferroleghe: Statistiche** (Non-Ferrous Metals and Ferroalloys: Statistics). 155 pages. 1950. Arienda Minerali Metallici Italiani, Rome, Italy.

Data on the production, foreign trade, prices, and consumption of nonferrous metals and ferro-alloys for Italy and the leading producing and consuming countries. (A4)

B

RAW MATERIALS AND ORE PREPARATION

86-B. A New Surface Measurement Tool for Mineral Engineers. F. W. Bloecher, Jr. *Mining Engineering,* v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 190, 1951, p. 255-258.

Method and apparatus for determination of the surface area of finely divided minerals. It involves low-temperature krypton adsorption measurements and the technique described by Beebe. 18 ref. (B general, S15)

87-B. Fused Stabilized Zirconia. Part III. Properties and Uses of Stabilized Zirconia Products. Osgood J. Whittemore. *Industrial Heating,* v. 18, Mar. 1951, p. 512, 514, 516.

An illustrated survey. (B19)

88-B. A Review of World Coal and Iron Ore Resources and Their Utilization for Manufacture of Steel. Part II. W. C. Rueckel. *Blast Furnace and Steel Plant,* v. 39, Mar. 1951, p. 327-332.

Continues survey and includes information on Russian capacity and production. (B10, A4, Fe, ST)

89-B. Brazilian Iron Ore Resources. R. G. Walker. *Blast Furnace and Steel Plant,* v. 39, Mar. 1951, p. 337-338.

Brief review. (B10, Fe)

90-B. The World's Largest Sintering Plant. W. J. Urban. *Blast Furnace and Steel Plant,* v. 39, Mar. 1951, p. 339-342.

Machine having a hearth width of 12 ft., and an active length of 168 ft., developed by American Ore Reclamation Co. and Blackwell Zinc Co. for sintering of Zn ore, but equally applicable to the sintering of Fe ores. (B16, Zn, Fe)

91-B. More Manganese From American Ores and Slags. E. C. Wright. *Metal Progress,* v. 59, Mar. 1951, p. 347-353.

Method for concentration of Mn from low-Mn materials, such as low-grade domestic Mn-ores and steel-mill slags, consisting of smelting the Mn-bearing materials in a blast furnace to produce a high-Mn pig iron, then partially oxidizing the pig iron in a converter to obtain a Mn-rich slag. Small laboratory heats indicated that slags containing 40-50% MnO can readily be produced by blowing 3-4% Mn pig iron down to about 0.8% Mn. Such slags had MnO-FeO ratios greater than 4 to 1, and hence, can be utilized in the production of manganese ferroalloys. An important part of the Mn requirements of the steel industry can be met by using native, low-grade manganese ores and recycling the steel-plant slags. (B21, Mn, ST)

92-B. L. S. Iron Ore Mines' 1950 Shipments Totaled 82,186,545 Gross Tons. *Skillings' Mining Review,* v. 39, Mar. 24, 1951, p. 1-2.

Tabulation of Lake Superior shipments by range and by mine, including separate table for beneficiated ores. (B10, A4, Fe)

93-B. New Zirconia Refractory Material Useful at Temperatures to 4600 F. *Materials & Methods,* v. 33, Mar. 1951, p. 81.

Properties and applications. (B19)

94-B. Sintering Nonferrous Metals. A. A. Nilsen and W. J. Urban. *Journal of Metals,* v. 3, Apr. 1951, p. 311-312.

Equipment made by American Ore Reclamation Co. (B16, EG-a)

95-B. Taconite: Iron Ore Bonanza. Morton M. Hunt. *Steelways,* v. 7, Mar. 1951, p. 1-5.

Popularized story of the development of commercially feasible taconite beneficiation process. (B14, Fe)

96-B. Studies in Cassiterite Flotation. E. J. Pryor and S. A. Wrobel. *Bulletin of the Institution of Mining and Metallurgy,* Mar. 1951; *Transactions,* v. 60, pt. 6, 1950-51, p. 201-237.

Classifies cassiterite-bearing minerals into three groups, and defines their properties. Conditions for the activation and froth flotation of tin with xanthate collectors; experimental verification. Laboratory flotation of cassiterite from Cornwall, together with the conditioning treatment needed to activate the mineral surface. 12 ref. (B14, Sn)

97-B. Minor Uses of the Light Metals. III. Titanium as a Deoxidizer. *Light Metals,* v. 14, Mar. 1951, p. 153-154.

As applied to deoxidation of steel and cast iron. (B22, Ti, ST, CI)

98-B. FluoSolids Roasting of Sulphides. T. B. Counselman. *Mining Congress Journal,* v. 37, Mar. 1951, p. 30-34, 53.

See abstract of "FluoSolids for Roasting", *Engineering and Mining Journal,* item 103-B, 1950. (B15)

99-B. Utah's New Uranium Mill. John A. Butler. *Engineering and Mining Journal,* v. 152, Mar. 1951, p. 56-62.

How a continuous leaching technique is increasing uranium production at Galigher Co., Monticello, Utah. Vanadium is also recovered. Includes flow diagrams. (B14, U, V)

100-B. Concentration of Oxide and Silicate Manganese Ores From the Vicinity of Golconda, Nev. B. K. Shibler and R. R. Wells. *U. S. Bureau of Mines,* Report of Investigation 4754, Jan. 1951, 16 pages.

Tests made to determine the amenability of ores from five manganese properties near Golconda, Nev. (B14, Mn)

101-B. Simple Treatment Methods for Oxide Gold and Silver Ores. A. L. Engel. *U. S. Bureau of Mines,* Report of Investigation 4758, Jan. 1951, 14 pages.

Preliminary tests made to assist in the economical exploitation of low-grade and marginal ores. Methods of treatment used include gravity concentration, amalgamation, flotation, and cyanidation. (B14, Ag, Au)

102-B. Experimental Treatment of Oxidized Lead-Silver Ore From Eureka, Nev. A. L. Engel. *U. S. Bureau of Mines,* Report of Investigations 4762, Jan. 1951, 9 pages.

Gravity concentration, flotation, and cyanidation tests on low-grade ores. (B14, Ag, Pb)

103-B. Concentration of Carbonate and Oxide Manganese Ores From Silver Bow, Jefferson and Park Counties, Mont. K. C. Dean and J. V. Batty. *U. S. Bureau of Mines.* Report of Investigations 4767, Mar. 1951, 22 pages.

Laboratory tests to determine the amenability of Tzarena claim, Minnie Jane mine, McClellan-Eackley lease, and Irma mine ores to standard ore-dressing methods. (B14, Mn)

104-B. Use of Magnetic Ores From New York State. K. G. LeViseur. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 29-37.

Previously abstracted from *Blast Furnace and Steel Plant.* See item 60-B, 1951. (B14, B16, D1, Fe)

105-B. A Survey of Blast Furnace Sintering Practice. Robert E. Powers. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 185-216.

Previously abstracted from *Steel.* See item 31-B, 1951. (B16, Fe)

106-B. The Role of Alumina in Slags. F. E. Lathe. *Canadian Mining and Metallurgical Bulletin,* v. 44, Mar. 1951, p. 165-173; disc. p. 173-174; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 95-103; disc. p. 103-104.

Study, based largely upon phase diagrams and other theoretical considerations, but nevertheless addressed primarily to the practical metallurgist. Melting points in simple and complex oxide systems, Fe silicate slags, Ca silicate slags, and complex slags. 36 ref. (B21)

107-B. Magnetic Fractionation of Sphalerite in Zinc Concentrates. B. J. Walsh. *Canadian Mining and Metallurgical Bulletin,* v. 44, Mar. 1951, p. 175-180; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 105-110.

A Frantz ferromagnetic filter, 1.2 amp., and a Dings magnet, 0.3 amp., were used to fractionate seven Zn concentrates produced in the Province of Quebec. Results indicate that the magnetic susceptibility of sphalerite increases with increasing isomorphous iron content and that a satisfactory separation into christophite, marmatite, and ordinary sphalerite can be accomplished by magnetic fractionation. (B14, Zn)

108-B. Oil Firing of Non-Ferrous Metallurgical Furnace. M. Roddan. *Metal Treatment and Drop Forging,* v. 18, Mar. 1951, p. 111-117; disc. p. 117-118.

Types of fuel oil and their important features, as well as some of the various oil-fired furnaces available to the nonferrous industry for refining, melting and heating. (B18, C21, E10, EG-a)

109-B. A Review of Recent Work Done on the Sintering of Iron Ores. J. M. McLeod. *Journal of the Royal Technical College,* v. 5, Jan. 1950, p. 199-206.

Summarizes three papers (1942, 1944, and 1946) by the author and by R. Hay. (B16, Fe)

110-B. Measurement of the Surface Tension of Molten Silicates. T. B. King. *Journal of the Royal Technical College,* v. 5, Jan. 1950, p. 217-225.

Surface tension of molten slags is a guide to their constitution and to their foaming tendencies. An apparatus suitable for measurement of this property at temperatures up to 1600° C. It is an adaptation of the ring method, utilizing a sphere instead of a ring. Results for the manganese silicate, rhodonite, show that surface tension reaches a maximum at about 1525° C. This is tentatively explained in terms of changes in constitution of the liquid. Some relation exists between surface tension and foaming properties. Particulars of a modified apparatus using a platinum cylinder and capable of greater accuracy than the sphere method. (B21, P10)

111-B. Investigation of Flotation Tailings for Emperor Gold Mining Co., Ltd., Vatukoula, Fiji. Evan E. Hughes and C. Meharry. *Commonwealth Scientific and Industrial Organization and the Kalgoorlie School of Mines* (Joint Investigation), Ore-Dressing Investigation Report 403, May 1950, 5 pages. (B14, Au)

112-B. Tests to Determine a Method of Treatment of Ore From the Sterling Gold Mine, Marble Bar, W. A. Final Report. Evan E. Hughes and C. Meharry. *Commonwealth Scientific and Industrial Organization and the Kalgoorlie School of Mines* (Joint Investigation). Ore-Dressing Investigation Report 437, July 1950, 6 pages.

Results for various beneficiation processes. (B14, Au)

113-B. Separation of Nickel and Copper in Nickel-Copper Matte. (In German.) Helmut Schlecht and Leo Schlecht. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 4, Jan. 1951, p. 1-3.

Different methods and a new process in which the matte is heated, crushed, and then subjected to a mechanical separation process, or to flotation. (B13, B14, Ni, Cu)

114-B. Plant Experiences With a Sedimentation-Flotation Process for Separating Lead-Zinc Ore From the Willibald Mine in Ramsbeck. (In German.) Günther Salzmann. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 4, Jan. 1951, p. 7-14.

Details of the process. Includes flow diagrams of a 50-ton-per-hr. plant, also design, operating, and economic data. (B14, Pb, Zn)

115-B. Pulverized-Coal Firing in Furnaces Used in the Iron and Steel Industry. (In German.) Karl Kessels. *Stahl und Eisen,* v. 71, Jan. 18, 1951, p. 53-63; disc. p. 63-64.

Type of fuel; its preparation, grinding, storing, and conveying; design of pulverized-coal nozzles and furnaces; calorific value; and economics. (B18, Fe, ST)

116-B. Economic and Metallurgical Advantages of Chrome-Magnesite Over Silica Furnaces Refractories. (In German.) Peter Bremer. *Stahl und Eisen,* v. 71, Jan. 18, 1951, p. 64-69; disc. p. 69-71.

Cost analysis and data. (B19)

117-B. Preparation and Tests of Refractory Sulfide Crucibles. E. D. Eastman, Leo Brewer, LeRoy A. Bromley, Paul W. Gilles, and Norman L. Lofgren. *Journal of the American Ceramic Society,* v. 34, Apr. 1951, p. 128-134.

Crucibles were prepared from all of the sulfides of Ba, Ce, and Th, and also from some of the mixed sulfides of Ce with Th and U with Th. Type of molds used, as well as methods of pressing the sulfide powders. Sintering procedures and techniques for each of the various refractories. Tests of some of the crucibles indicate that they are satisfactory refractories for a large number of metals and halides. (B19)

118-B. Grinding Mills as Conditioners in Sulphide Flotation. C. G. McLachlan. *Mining Engineering,* v. 3, Apr. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 190, 1951, p. 347-350.

Laboratory flotation tests carried out on massive sulfide ores may not be reproducible in plant practice. When this occurs the discrepancy may be caused by differences between laboratory and plant grinding. Results of parallel flotation tests support this contention, and data show how tailing losses are affected in corresponding size zones. Data on a Cu-sulfide ore from Noranda Mines in Quebec are tabulated. (B13, B14, Cu)

119-B. Sinter Making at Appleby-Frodingham. G. D. Elliot and N. D. Macdonald. *Journal of the Iron and Steel Institute,* v. 167, Mar. 1951, p. 261-272.

Large-scale research conducted to improve the quality of sinter manufactured from Frodingham and Northampton iron-ore fines. Several aspects of plant, raw materials, and practice. 12 ref. (B16, Fe)

120-B. (Book) **Refractory Materials; Their Manufacture and Use.** Ed. 3. Alfred B. Searle. 895 pages. 1950. Mapleton House, 5415 17th Ave., Brooklyn 4, N. Y. $9.00.

A reprint of the 1940 edition. (B19)

121-B. (Book) **Refractories Bibliography—1928-1947, Inclusive.** 1088 pages. 1950. American Ceramic Society, Columbus, Ohio.

Lists 13,300 items with abstracts covering U. S. and foreign periodical literature and patents. The initial list of references and abstracts was prepared at Battelle. Arrangement is alphabetically by author. Includes subject index. (B19)

122-B. (Pamphlet) **World Iron Ore Resources and Their Utilization.** 1950. 74 pages. United Nations, Department of Economic Affairs, Lake Success, N. Y.

Economic feasibility of developing iron and steel production in the under-developed areas of the world. (B10, Fe)

123-B. (Book) **Annotated Bibliography of Economic Geology.** Vol. XVII, 1944. Robert B. Miller, editor. 423

pages. Sept. 1950. Economic Geology Publishing Co., Urbana, Ill.

Includes section on metallic-ore resources with 308 references. (B10)

124-B. (Book) **Die Eisenerzvorrate der Welt** (Iron Ore Resources of the World). G. Einicke. 418 pages. Verlag Stahleisen, Dusseldorf, Germany. 66 DM.

The latest available information on iron-ore deposits is compiled continent by continent, country by country. Effects of geological formations, iron content of ore, accessibility, cost of transportation, political and economic considerations. Ore beds of importance to the German iron and steel industry are emphasized. (B10, A4, Fe)

C

NONFERROUS EXTRACTION AND REFINING

41-C. Ductile Zirconium. W. W. Stephens and J. H. McClain. *Chemical Engineering,* v. 58, Mar. 1951, p. 116-117.

New process and equipment for production by reduction of $ZrCl_4$ with molten Mg. Basic steps are zirconium carbide production, purification of crude chloride, salt removal, and sheet production. (C26, Zr)

42-C. Combined Ore Smelting and Scrap Reclamation Practice. C. C. Downie. *Mining Journal,* v. 236, Mar. 16, 1951, p. 248-249.

Procedures and benefits of combined operations for Cu, Pb, Zn, and Sb. (C21, A8, Cu, Pb, Zn, Sb)

43-C. German Developments: Reclaiming and Refining Light Metal Scrap. *Modern Metals,* v. 7, Mar. 1951, p. 54-55. (From "Fabrication of Aluminum in Germany," C. F. Nagel, Jr., B. C. McFadden, and G. D. Welty, Office for Military Government for Germany.)

Dry-hearth furnace. Flow chart for movement of Al and Mg scrap in the dual reclaiming and refining method described. Vacuum furnaces used are diagrammed. (C25, A8, Al, Mg)

44-C. Vacuum Treatment of Parkes' Process Crusts on a Pilot-Plant Scale. A. W. Schlechten and R. F. Doelling. *Journal of Metals,* v. 3, Apr. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, p. 327-330.

Crusts were vacuum distilled using a shortened Pidgeon retort. Zn was effectively removed below 800° C. and recovered as a sheet easily stripped from the furnace liner. Pb distillation required about 950° C. and the resulting condensate tended to stick to the thin metal liner. Final purity of the silver is limited only by presence of nonvolatile metals such as copper. (C22, Ag, Pb, Zn)

45-C. Factors Affecting the Reduction of Zinc Oxide by Carbon; A Study of the Reduction of Zinc Metaferrite by Carbon. *Bulletin of the Institution of Mining and Metallurgy,* Mar. 1951; *Transactions,* v. 60, pt. 6, 1950-51, p. 239-246.

Discussion of above papers by D. W. Hopkins and A. G. Adlington. (Jan. 1951 issue; item 22-C, 1951). (C21, Zn)

46-C. A Method for the Preparation of High-Purity Indium Metal. *Bulletin of the Institution of Mining and Metallurgy,* Mar. 1951; *Transactions,* v. 60, pt. 6, 1950-51, p. 246-248.

Discussion of above paper by T. A. A. Quarm. (Jan. 1951 issue; item 1-C, 1951.) (C4, In)

47-C. New Smelter Gives Titanium Industry a Lift. *Engineering and Mining Journal,* v. 152, Mar. 1951, p. 76-78.

Smelter at Sorel, Quebec. (C21, Ti)

48-C. Continuous Brass Casting Machine. *Metal Industry,* v. 78, Mar. 23, 1951, p. 226-227.

New British installation for production of brass billets. (C5, Cu)

49-C. Effect of Fluorides on an Al-Mg Alloy. (In German.) Wilhelm Dautzenberg. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 4, Jan. 1951, p. 14-19.

Experiments made with CaF_2, NaF, and cryolite mixed with NaCl at 800, 900, and 1000° C. to determine their ability to react with Mg in an Al-Mg alloy containing 5.5% Mg, in order to refine scrap Al of similar composition. (C21, A8, Al)

50-C. Production of Zinc in Vertical Muffle Furnaces. (In German.) A. Roitzheim. *Metall,* v. 5, Feb. 1951, p. 63-67.

Reduction of ZnO in both horizontal and vertical muffles compared. Design and operation of a successful continuous vertical muffle furnace; suggestions for further improvements. (C21, Zn)

51-C. The Copper Reverberatory Furnace. W. H. Dennis. *Metallurgia,* v. 43, Mar. 1951, p. 107-111.

The increasing use of fine flotation concentrates in production of Cu has caused the reverberatory furnace to displace the blast furnace for smelting. Some of the factors affecting design, construction, and operation. (C21, Cu)

52-C. The Nature of Anions Discharged at the Anode During Electrolysis of Cryolite-Alumina Melts. (In Russian.) S. I. Rempel. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 76, Jan. 21, 1951, p. 411-414.

Results of experimental and theoretical investigations that are of importance in electrolytic production of metallic Al. (C23, Al)

D

FERROUS REDUCTION AND REFINING

124-D. Manufacture of Quality Steel in Russia. N. H. Polakowski. *Metal Progress,* v. 59, Mar. 1951, p. 359-363.

An expatriate tells of some of the difficulties the steelmaker faces, some of them due to official regulations governing details of technical practice worked out to cover ideal situations. No fundamental improvements have occurred in the art and science of steel manufacture and treatment. Equipment generally is modern since a 6-fold expansion has taken place in the last 20 years. Quantitative information concerning compositions and processes, including salt baths and atmospheres for heat treatment, cyaniding, and carburization, also on refractory life, and rolling mills, tube-making, etc. (D general, F general, J general, ST)

125-D. Economics of a 500-Ton Open Hearth Furnace. W. W. Kompart. *Iron and Steel Engineer,* v. 28, Mar. 1951, p. 55-57; disc., p. 57.

Furnace at Weirton Steel Co., Weirton, W. Va. Economic and technological considerations. (D2, ST)

126-D. Operating Advantages and Limitations of Open Hearth Controls. B. B. Bargman. *Iron and Steel Engineer,* v. 28, Mar. 1951, p. 91-95; disc., p. 95-97.

Control of fuel, air, steam, furnace pressure, furnace reversal, and temperature. (D2, S18, ST)

127-D. Pressure Operation of Blast Furnaces—1950. R. P. Liggett. *Blast Furnace and Steel Plant,* v. 39, Mar. 1951, p. 324-326, 332.

Experiences of Republic Steel Corp. during the past year. (D1, ST)

128-D. Treatment of Bricks to Prevent Carbon Monoxide Disintegration. J. A. Shea. *Blast Furnace and Steel Plant,* v. 39, Mar. 1951, p. 333-336.

See abstract of "How to Prevent Blast Furnace Lining Disintegration," *Steel,* item 318-D, 1950. (D1)

129-D. New Ingot Mold Castings Are in Use. J. J. Golden. *Iron Age,* v. 167, Mar. 29, 1951, p. 83-85.

Four substitutes for tar coatings of ingot molds were thoroughly tested. Darmold and Hydropaste were not satisfactory but Darmold AE has been tentatively adopted at Gary Steel Works. New types of applicators developed for the newer coatings. (D9, ST)

130-D. Quenching and Digging Out a Blast Furnace. K. C. McCutcheon, W. E. Marshall, and H. C. Barnes. *Journal of Metals,* v. 3, Apr. 1951, p. 304-310.

In the Spring of 1948 an experimental run was made in a small blast furnace, using various proportions of ore and pelletized magnetite concentrates, ending up with an iron-bearing burden consisting of 100% pellets made from Minnesota taconite. The run demonstrated that increasing amounts up to 100% pellets could be used in this furnace, and corroborated laboratory findings on good reducibility of pellets. Results found after completion of the production run, when the furnace was cooled off in neutral atmosphere and dug out from the top down. (D1, ST)

131-D. Inside the Blast Furnace. *Steelways,* v. 7, Mar. 1951, p. 16-17.

Pictorial flow chart shows how iron ore is converted to iron. (D1, ST)

132-D. Desulphurizing Molten Iron With Calcium Carbide. S. D. Baumer and P. M. Hulme. *Journal of Metals,* v. 3, Apr. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, p. 313-318.

Laboratory tests made in the late 30's showed that carbide is an excellent desulfurizing agent for molten Fe; however, it is very difficult to make it react because it usually floats as a dry powder on top of the metal. Various methods of obtaining intimate contact have been investigated. Details of laboratory and pilot-plant development of a gas-injection, screw-feed method. Results show feasibility of the process on either a batch or continuous basis. Over 90% of the S content is removed. When less than 0.06-0.08% S is desired in the product, the process is believed to be economically feasible. (D general, Fe)

133-D. Distribution of Sulphur Between Liquid Iron and Slags of Low Iron-Oxide Concentrations. R. Rocca, N. J. Grant, and J. Chipman. *Journal of Metals,* v. 3, Apr. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, p. 319-326.

Desulfurization of liquid Fe by reducing slags of the electric furnace type was studied from 65 heats. Variations were made in basicity over a wide range and in FeO up to about 5% to determine their effects on desulfurization. The role of FeO in desulfurization from the blast furnace, to the electric furnace, to the oxidizing conditions of the openhearth is shown to fit a relatively simple pattern of behavior. 17 ref. (D general, Fe, ST)

134-D. Heat Losses in Electric-Arc Steel Furnaces. (In Russian.) N. V. Orkorokov. *Promyshlennaya Energetika* (Industrial Power), v. 7, Dec. 1950, p. 1-5.

The problem was studied theoretically. Formulas are derived for calculation of heat losses under different conditions of operation. Methods of reducing heat losses through the lining of the furnace and into the cooling water. (D5, ST)

135-D. Production of Blast-Furnace Coke From Other Than Type PS Coals. (In Russian.) Ya. M. Obukhovskii. *Ugol* (Coal), v. 25, Dec. 1950, p. 15-19.

"Type PS" is the standard coking type. The possibility of introducing certain long-flame coals into the coke charge of blast furnaces was investigated. Experimental work showed that a savings of 325,000 tons per year of scarce coals of the PS type may be effected. Optimum lump-size ranges for different types of cast iron were determined. (D1, B18, Fe)

136-D. The Physical Chemistry of Steelmaking. Karl L. Fetters. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 15-24.

The problem; the more important work and workers; the principal tools of research and philosophies of research workers; contemporary work in the field, including AISI currently sponsored projects; and a look at the future. (D general ST)

137-D. The Design of a New Open Hearth Shop. H. E. Warren, Jr. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 53-77.

Previously abstracted from *Industrial Heating.* See item 22-D, 1951. (D2, ST)

138-D. The Use of Sintered Pyrrhotite Residues on the Production of Low Phosphorus Pig Iron. L. A. Miller. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 91-105.

Sinter used at the Lyles-Wrigley, Tennessee Furnace; the furnace; practice at low, medium, and high blast heat; and present operation. (D1, CI)

139-D. Pressure Operation of Blast Furnaces—1950. R. P. Liggett. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 233-243.

Previously abstracted from *Blast Furnace and Steel Plant.* See item 127-D, 1951. (D1, ST)

140-D. Manufacture of Deep Drawing Steel. R. W. Evans. *Engineer,* v. 191, Mar. 9, 1951, p. 306-309; Mar. 16, 1951, p. 338-340.

Properties of the blank which must undergo deformation, and the steelmaking technique which governs chemical analysis and ingot structure. First installment: the deep drawing operation in general, correlation of deep drawing with other properties, steel ingot requirements (structure and composition), and age hardening effects. Second part: the manufacturing process, hearth maintenance, plant layout, furnace design and repair, comparison with the U. S., and future prospects. (D2, G4, CN)

141-D. Oxygen in the Production of Carbon Steels From the Arc Furnace. A. C. Brearley. *Foundry Trade Journal,* v. 90, Mar. 22, 1951, p. 303-309.

Experiences of K. & L. Steelfounders, Ltd., in Britain. Practice prior to use of oxygen, then early experimental work and problems encountered. Observations made during a trip to America. Details of present procedure for both acid and basic electric steel melting, and economics involved. (D5, ST)

142-D. Review of Work on Blast Furnace Reactions. J. Taylor. *Journal of the Royal Technical College,* v. 5, Jan. 1950, p. 181-189.

Reviews work described in "The Effect of Operating Conditions on Type of Reduction and Carbon Rates in the Blast Furnace," *Journal of the West of Scotland Iron Steel Institute,* v. 54, 1946-47. See item 2B-204, 1948. (D1, ST)

143-D. The Reactions of Sulphur in Steelmaking. I. The Physical Chemistry of Sulphur Removal in Steel Making. P. T. Carter. *Journal of the Royal Technical College,* v. 5, Jan. 1950, p. 190-198.

Summary of a paper which appeared in "General Discussion on the Physical Chemistry of Process Metallurgy," *Faraday Society,* 1948 (item 2B-308, 1949). Effects of temperature and basic constituents of the slag are discussed at greater length and more detailed thermodynamic data are given. 27 ref. (D general, P12, ST)

144-D. Contribution to the Metallurgy of the Blast Furnace. (In German.) Theo Kootz and Willy Oelsen. *Archiv für das Eisenhüttenwesen,* v. 22, Jan.-Feb. 1951, p. 1-4.

Based on laboratory experiments on the reduction of iron ore, reactions in the blast furnace are explained; especially the importance of CO decomposition and effect of nascent carbon. Results indicate the probability that SiO_2 is reduced after Fe and P compounds, but before MnO_2 and before the melt is desulfurized. (D1, Fe)

145-D. Deoxidation of Steel With Acid Synthetic Slags. (In German.) Max Paschke and Günter Gesche. *Archiv für das Eisenhüttenwesen,* v. 22, Jan.-Feb. 1951, p. 5-8.

Experiments show that oxidation with acid slag (CaO-SiO_2 ratio: 0-0.8) is materially affected by SiO_2 content and viscosity. Al_2O_3 merely affects viscosity of the slag, and a far better deoxidizing effect is obtained in a sand crucible than in a corundum crucible. (D general, ST)

146-D. Chemical and Physicochemical Bases of Deoxidation With Manganese, Silicon, and Aluminum. (In German.) Walter Koch, Hanns Wentrup, and Otto Reif. *Archiv für das Eisenhüttenwesen,* v. 22, Jan.-Feb. 1951, p. 15-29; disc. p. 29-30.

Experiments on inclusions formed by simultaneous deoxidation of steel with Mn, Si, and Al show that their compositions are not in equilibrium with the final compositions of the melts, but that they are materially affected by the deoxidizing reaction. Type of inclusion as well as degree of deoxidation is dependent on Mn: Si ratio. Includes photomicrographs and X-ray diffraction patterns. 16 ref. (D general, ST)

147-D. Iron Sparks Produced During Bessemerizing in a Small Converter. (In German.) E. J. Kohlmeyer. *Giesserei,* v. 38 (new ser., v. 4), Feb. 22, 1951, p. 73-76.

Experimental studies with an iron containing 4.3% C indicate that iron evaporates at 1300° C. in the form of unstable FeCO, which decomposes, after leaving the melt, into Fe and CO. If the melt is made in the absence of oxygen (air or iron oxide), the vaporized iron can be recovered in the form of a very fine powder. Includes diagram of the Fe-C-O_2 system and illustrations showing the appearance of the sparks discharged from the converter under various conditions. (D3, ST)

148-D. Production of Low-Phosphorus and Low-Nitrogen Steels by Use of Exothermic Addition Agents. (In German.) Heinz Höfges and Jakob Willems. *Stahl und Eisen,* v. 71, Mar. 15, 1951, p. 283-287.

Experiments were made with steels melted at low temperatures in the basic furnace in order to determine the phosphorus and nitrogen-reducing effect of ferrosilicon, Ca-Si, Al, and CaC_2. Best results were obtained with Ca-Si, while ferrosilicon and CaC_2 liberated practically no heat. 21 ref. (D2, ST)

149-D. Steelmaking for Castings. John Howe Hall. *Foundry,* v. 79, Apr. 1951, p. 128-129, 263-271.

Design features of the openhearth furnace and its method of operation. (Second of a series covering melting practice in the steel foundry; to be continued.) (D2, CI)

150-D. The Evolution of the All-Carbon Blast-Furnace. J. H. Chesters, G. D. Elliott, and J. Mackenzie. *Journal of the Iron and Steel Institute,* v. 167, Mar. 1951, p. 273-282.

The use of carbon bricks in the blast furnace is traced from the early hearth experiments, designed to minimize breakouts, to the use of three all-carbon blast-furnaces by a British steelmaker. Trials of carbon bricks in bosh and stack with particular reference to scaffold formation. (D1, ST)

151-D. Ingot Heat Conservation; Ingot Mould Temperature Measurements. R. T. Fowler and J. Stringer. *Journal of the Iron and Steel Institute,* v. 167, Mar. 1951, p. 283-288.

Further measurements on surface temperatures of an ingot mold were made, and the technique of temperature measurement by fixed thermocouples was extended to include temperatures through the walls. Two trials were made with the mold initially at a temperature of 30° C., and one trial with it at 125° C., the latter being representative of normal practice. Temperature gradients and isotherms are plotted to give a picture of the overall temperature distribution throughout the mold at various times after teeming. Heat content of the mold was calculated and amount of heat removed from the steel during solidification estimated. (D9, S16, ST)

152-D. Ten-Ton Ingot Moulds; A Comparison of Design and Conditions of Use. A. Jackson. *Journal of the Iron and Steel Institute,* v. 167, Mar. 1951, p. 289-301.

Design and life of two types of 10-ton molds and bottom plates are compared under normal conditions of use. Results of detailed experiments, designed to indicate effect of certain variables in conditions of use. Effects of short and long tap-to-strip times and normal and long cooling times between heats. Various types of failures. Experiments on heating and cooling rate of molds, effects of annealing on mold life, etc. (D9, ST)

E

FOUNDRY

198-E. A New Type of Cupola. Tom Bishop. *Metal Progress,* v. 59, Mar. 1951, p. 376.

"Metallurgical blast cupola", which has been operating for over a year in Liege, Belgium, producing an average of 1200 metric tons of iron per month. Tests indicate that the iron produced is in certain respect superior to that made in the conventional cupola. Advantages and disadvantages. (E10, CI)

199-E. North British Steel Foundry, Bathgate. *Foundry Trade Journal,* v. 90, Mar. 8, 1951, p. 249-256.

Scottish jobbing steel foundry which produces straight-carbon and

low-alloy steel castings from a few pounds up to about 5 tons in weight. (E11, CI)

200-E. Centrifugal Steel Castings for Gas Turbines. J. Taylor and D. H. Armitage. *Foundry Trade Journal,* v. 90, Mar. 8, 1951, p. 259-260, 265. (A condensation).

Evolution of the production of centrifugal castings, and fields of application of the horizontal and vertical-axis methods. Method of manufacture and the inspection procedure applied in order to attain the high standards essential for production of gas-turbine components. (E14, S13, CI)

201-E. Straight Cast-Iron Pipes. J. L. Handley. *Foundry Trade Journal,* v. 90, Mar. 15, 1951, p. 275-280.

Methods used in making of straight cast-iron pipes from the smaller sizes used for soil and vent pipes to the larger sizes of pressure pipes. Numerous diagrams. (E11, CI)

202-E. The "C" Process. *Foundry Trade Journal,* v. 90, Mar. 15, 1951, p. 281-284.

Production of castings from shell molds comprised of a thermosetting mixture of sand and synthetic resin. The mold shells are formed by contact between the mixture and heated pattern. (E18, E19)

203-E. Selecting Components for Die-Castings. W. M. Halliday. *Foundry Trade Journal,* v. 90, Mar. 15, 1951, p. 287-290.

Gravity vs. pressure casting of components, choice of alloy, size of component, physical limitations, quantities required, initial die costs, and die life and maintenance costs. (E13)

204-E. Mercury Patterns for Precision Casting. *Machinery* (London), v. 78, Mar. 8, 1951, p. 396-397.

Picture story of process developed by American Mercast Corp. The metals so far cast have included Al and stainless steel. (E15, Al, SS)

205-E. Repetition Castings. *Iron and Steel,* v. 24, Mar. 1951, p. 75-82.

Successful mechanization at a gray-iron foundry in Britain which specializes in heating and cooking stoves. Details of specific items. (E11, CI)

206-E. Core Supports. *Iron and Steel,* v. 24, Mar. 1951, p. 86.

Importance of correct choice of reinforcement for sand cores. (E21)

207-E. Sand Practice. W. B. Parkes. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1951, p. 705-707; disc. p. 707-717.

Compares British and American practice. (E18)

208-E. General Metallurgical Aspects. H. T. Angus. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1951, p. 719-721; disc. p. 725-736.

Compares metallurgical aspects of British and American foundry practice. (E25)

209-E. Melting Practice and Metal Handling. N. Charlton. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1951, p. 723-725; disc. p. 725-736.

Compares British and American melting practices. (E10)

210-E. Foundry Operations and Equipment. 1. A. Kirkham. 2. G. W. Nicholls. 3. W. R. Marsland. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1951, p. 763; 767-770; 773; disc. p. 764-766; 770-772; 773-774.

Compares various phases of British and American foundry practice. (E general)

211-E. Patterns. I. Small Patterns. W. R. Marsland. **2. Large Patterns.** E. J. Ross. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1951, p. 775, 777; disc. p. 778-780.

Compares British and U. S. pattern-making practices. (E17)

212-E. Coremaking. M. Martin. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Feb. 1951, p. 781-782; disc. p. 783-786.

Compares British and U. S. coremaking practice. (E21)

213-E. Intensification of the Smelting Process in the Cupola. (In Russian.) B. G. Grinberg. *Torfyanaya Promyshlennost* (Peat Industry), v. 27, Dec. 1950, p. 18-20.

Methods designed to increase productivity of the cupola, decrease fuel consumption, increase temperature of metal, and improve the quality of the product. Methods investigated include use of three rows of tuyeres, preheating of the cupola blast, and oxygen enrichment of the blast. Advantages of each are discussed. (E10, CI)

214-E. Study on Zinc Alloys for Casting. IV. Fluidity of Zamak Alloys. (In Japanese.) Kazuo Katori, Mikio Suzuki, and Kingo Naoki. *Journal of Mechanical Laboratory,* v. 4, no. 7, Oct. 1950, p. 268-273.

Effects of variations in composition, including Mg additions. Results are summarized in English. (E25, Zn)

215-E. Study on the Surface of Castings. VI. Screen-Test Method for Molding Sand. (In Japanese.) Kazuo Katori, Tsuneyuki Okakura, and Kenji Hashimoto. *Journal of Mechanical Laboratory,* v. 4, no. 7, Oct. 1950, p. 274-278.

Results of investigation are tabulated, charted, and summarized in English. (E18)

216-E. Choke Control in Finger Gating. W. H. Johnson, H. F. Bishop, and W. S. Pellini. *Foundry,* v. 79, Apr. 1951, p. 116-121, 275-278.

Various designs of finger-gating systems were studied to evolve general principles of choke control for multiple-finger gating systems. If a choke condition is developed at the finger inlets, the gating system becomes pressurized and forced, and uniform flow occurs from all fingers regardless of position. Geometric shape of the fingers was shown to be of secondary importance to choke control. The relationships between geometric and hydraulic choked conditions. (E22)

217-E. Deoxidation in Production of Nodular Cast Iron. Gerhard Derge. *Foundry,* v. 79, Apr. 1951, p. 122-123.

Experiments show that Mg treatment which results in nodule formation is also accompanied by deoxidation. The melting stock was prepared by saturating Armco ingot iron with carbon. Melting was done in a 15-lb. induction furnace, and 50% ferrosilicon was added to give an estimated 3% Si in the final product. The metal was poured at 1370° C. into a preheated transfer pot containing the Mg alloy and cast at once into dry sand molds. Samples were sucked into a chill mold by the modified wedge method just before pouring and after the Mg treatment. They were analyzed for O_2 by vacuum fusion and for residual Mg spectroscopically. Residual Al was also determined. (E25, CI)

218-E. Refrigeration Controls Blast Moisture. William K. Mitchell. *Foundry,* v. 79, Apr. 1951, p. 134-137.

A study of scrap loss in the gray-iron foundry of Delco-Remy Div., General Motors Corp., Anderson, Ind., showed that the scrap loss closely followed the humidity of the atmosphere. To combat this problem, equipment for dehumidifying the air being fed into the cupola was installed. (E10)

219-E. Principles of Risering. Charles F. Walton. *Foundry,* v. 79, Apr. 1951, p. 154, 156.

One of series on "ABC's of Foundry Practice." (E22)

220-E. New Cupola Design Has Many Features. *Foundry,* v. 79, Apr. 1951, p. 192.

New features in cupola construction designed by F. J. Zippler, Pittsburgh, said to save 25% fuel, increase melting capacity 25%, deliver real hot iron, and drop clean at the end of the heat. (E10, CI)

221-E. Report on Ultrasonics. Thomas A. Dickinson. *Foundry,* v. 79, Apr. 1951, p. 224, 226, 228, 230.

Use in the foundry for ultrasonic sirens to agglomerate smoke particles, for reflectoscopes to indicate defects, for magnetostriction generators for degreasing. (E general, S general)

222-E. Mechanized Aids in the Foundry. A. S. Beech. *Engineering,* v. 171, Mar. 16, 1951, p. 324-326; Mar. 23, 1951, p. 355-358. **Further Mechanical Aids for the Foundry.** *Engineer,* v. 191, Mar. 16, 1951, p. 360-363. (A condensation.)

Some developments of the past decade. (E general)

223-E. The Production of Aluminium Alloy Pistons. *Machinery* (London), v. 78, Mar. 22, 1951, p. 463-471.

Procedures and equipment of British firm, with emphasis on gravity die casting, sand casting, several machining operations, and heat treatment. (E11, E13, G17, J general, Al)

224-E. Selection of Al Casting Alloys on the Basis of Their Castability in Sand and Chill Molds (In French and German.) R. Irmann. *Aluminium Suisse,* Jan. 1951, p. 26-31.

Casting properties of the eight most important Al alloys. A table shows qualitatively comparative mechanical and chemical properties. (E11, E12, Al)

225-E. Advances in Foundry Practice During the First Half of 1950. (In German.) Paul A. Heller. *Stahl und Eisen,* v. 71, Jan. 4, 1951, p. 35-41; Jan. 18, 1951, p. 84-89.

Descriptive, correlated review of the literature. 100 ref. (E general)

226-E. Contribution to Knowledge Concerning "Temper Ore". (In German.) F. Roll. *Giesserei,* v. 38, (new ser. v. 4), Jan. 11, 1951, p. 4-8.

The composition of red hematite used for the production of malleable cast iron, also reactions occurring during the malleablizing process. "Temper ore" refers to a special type of ore most suitable for this process. 10 ref. (E11, J23, CI)

227-E. Rejects in the Gray-Iron Foundry With Special Emphasis on the Pig-Iron Problem. (In German.) E. Feil. *Giesserei,* v. 38 (new ser., v. 4), Jan. 25, 1951, p. 29-33.

Practical measures for reducing the amount of rejects and improving the quality of castings by addition of steel scrap to the charge; selection of proper molding sands; and maintenance of proper casting conditions. (E11, CI)

228-E. The Cement-Sand Mold and Core Process. (In German.) M. Beilhack. *Giesserei,* v. 38 (new ser., v. 4), Jan. 25, 1951, p. 37-39.

The mold is made of cement (of different kinds) and dustless sand. A graph shows the effect of water content on gas permeability. (E18)

229-E. Gate Design and Its Importance to Success in Casting (In German.) H. U. Doliwa. *Giesserei,* v. 38 (new ser., v. 4), Feb. 8, 1951, p. 49-51.

Application of fundamental physical principles to gating-system design. (E22)

230-E. The Significance of Reduced-Density Curves of Compacted Sands in Molding-Sand Testing. (In German.) W. Reitmeister. *Giesserei,* v. 38 (new ser., v. 4), Feb. 8, 1951, p. 54-57.

Swelling or "compactibility" curves of a sand often indicate properties of the sand (such as gas permeability and strength) which are difficult or impossible to determine by other testing methods. Specific sands and their respective test data. (E18)

231-E. Pressure Casting Process for Light Metals (In German.) R. Butz. *Giesserei,* v. 38 (new ser., v. 4), Feb. 8, 1951, p. 61.

Equipment and formulas for computing the applied pressures. (E13, Al, Mg)

232-E. Welding Gray Iron. (In German.) C. Stieler. *Giesserei,* v. 38 (new ser., v. 4), Feb. 8, 1951, p. 62-64.

Each of the various methods of welding; namely, thermite welding, gas welding, and cold and hot electric welding. (E general, CI)

233-E. Production of Nonshrinking Cores. (In German.) F. Roll. *Giesserei,* v. 38 (new ser., v. 4), Feb. 22, 1951, p. 76-79.

The compressibility of different core sands was determined at and above 20° C. The importance of sand compressibility in production of complex castings is demonstrated. (E18)

234-E. Reinforced Cast Iron. (In German.) K. Wittmoser. *Giesserei,* v. 38 (new ser., v. 4), Mar. 8, 1951, p. 110.

Gray iron with cast-in steel bars, the effect being similar to that of reinforcing bars in concrete—a considerable increase in strength. Includes photomicrographs. (E11, CI)

235-E. Removing Nonmetallic Inclusions in the Production of Babbitt Bearings, Especially Lead-Bronze Bearings. (In German.) A. Röhenbeck. *Metall,* v. 5, Feb. 1951, p. 57-58.

A series of U. S., British, and German patents dealing with this problem. (E25, Cu, SG-c)

236-E. Induction Heating in the Processing of Nonferrous Metals. (In German.) K. Kegel. *Metall,* v. 5, Mar. 1951, p. 103-106.

Use in the melting and soldering of nonferrous metals as well as in the production of tin-plate. 14 ref. (E10, K7, L16, EG-a)

237-E. General Observation on Light-Metal Melting. (In German.) W. Geuthner. *Metall,* v. 5, Mar. 1951, p. 107-110.

Factors to be considered in selecting the proper melting furnace. (E10, Al, Mg)

238-E. Chilled-Mold Casting of Brass. (In Dutch.) T. van der Klis. *Metalen,* v. 6, Feb. 15, 1951, p. 35-40; Feb. 28, 1951, p. 53-57.

Gravity die-casting of brass. The castings are between 50 and 1000 g. in weight. Special attention to practical aspects of the procedure. (E13, Cu)

239-E. Pouring Time in Relation to the Design of Gating Systems. (In Czech.) Jan Kieswetter. *Hutnické Listy,* v. 6, Jan. 1951, p. 14-22.

Theoretical development of formulas for determination of pouring time and dimensions of gating systems for gray-iron castings. Includes table for castings weighing 10 kg. to 40 tons and for wall thicknesses of 3-55 mm. Formulas are applied to several numerical examples. (E22, E23, CI)

240-E. Establishing Tolerances for Die Castings. H. K. Barton. *Proudct Engineering,* v. 22, Apr. 1951, p. 118-123.

Four conditions which affect dimensional accuracy of die castings: differential thermal expansion, lateral misalignment, wear of register pins, and distortion on cooling. (E13)

241-E. Commercial Tolerances for Die Castings. H. K. Barton. *Product Engineering,* v. 22, Apr. 1951, p. 169, 171.

Tabulation for Sn, Pb, Zn, Al, Mg, and Cu. (E13, S22, Cu, Sn, Pb, Zn, Al, Mg)

242-E. Glass Solves Delicate Coring Problems. D. D. Malcomb. *Iron Age,* v. 167, Apr. 12, 1951, p. 107-109.

Thin, fragile Al cores necessary for the production of radar tube-feed antenna units by investment casting are reinforced with Pyrex glass tubes. By this means, the cores are able to withstand turbulence and shock of the metal entering the cavity. (E15, T1, Al)

243-E. Aluminum Alloy Die Castings. Floyd A. Lewis. *Foundry,* v. 79, Apr. 1951, p. 124-127, 271-274.

The basic principles involved in Al die casting and the types of alloys used. (To be continued.) (E13, Al)

244-E. Die Casting Die Design. Part IV. (Continued.) H. K. Barton and James L. Erickson. *Magazine of Tooling and Production,* v. 17, Apr. 1951, p. 79-80, 148, 150, 152-153.

Various aspects of runner design. (To be continued.) (E13)

245-E. Heat Extraction at Corners and Curved Surfaces in Sand Moulds. R. W. Ruddle and R. A. Skinner. *Journal of the Institute of Metals,* v. 79, Mar. 1951, p. 35-56.

The rate at which a sand mold removes heat from corners (both external and re-entrant) and curved surfaces of castings was determined by means of temperature measurements made in the mold. The solidification times of castings can be roughly calculated by mathematical analysis of heat flow through a plane surface, and more accurate estimates are possible by using the correction factors given for corner and curvature effects. (E25)

246-E. Segregation of Iron and Manganese in Some Aluminium Casting Alloys. W. H. Glaisher. *Metallurgia,* v. 43, Mar. 1951, p. 127-131.

Results of investigations of gravity segregation which may occur in alloys within or close to the specifications D.T.D. 424 and L.A.C. 112, due to the presence of undue amounts of Fe and Mn. Recommendations on composition limits and procedure to minimize this effect in the production of castings. (E25, Al)

247-E. (Pamphlet) **Fundamentals of Steel Castings Design.** Charles W. Briggs. 32 pages, 1951. Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15. $0.20.

Fluidity, shrinkage, strength, stresses, hot tears, and thickness as they are related to design. Designing of various joining sections, tolerances, redesigning of forgings and weldments, etc. (E25, CI)

F

PRIMARY MECHANICAL WORKING

72-F. Measures Rolling Mill Load Continuously. *Iron Age,* v. 167, Mar. 22, 1951, p. 74.

Short steel columns to which SR-4 strain gages are bonded have been installed in the cold roll strip mill at the Edgewater plant of the Aluminum Co. of America. These new load-weighing devices provide accurate, continuous indication of roll loads. (F23)

73-F. The Use of Tungsten Carbide Dies in Wire Drawing and Nail Making. Edward C. Kinyon. *Wire and Wire Products,* v. 26, Mar. 1951, p. 215-217, 260-262.

Includes historical development. (F28, T7, ST, W, C-n)

74-F. Prop Extrusion is Production Milestone. Irving Stone. *Aviation Week,* v. 54, Mar. 19, 1951, p. 27-28, 32, 35.

Process for hot extrusion of one-piece, tapered, hollow steel propeller blades developed by Air Material Command, Curtiss-Wright, and others. (F24, SS)

75-F. Manufacture of Electric Fusion Welded Pipe. J. H. Middleton. *Iron and Steel Engineer,* v. 28, Mar. 1951, p. 66-69.

The submerged-arc electric welded pipe mill provides an economical method of producing large-diameter line pipe. Shearing, forming, and welding operations, to make this pipe at Republic Steel Corp.'s Gadsden, Ala., plant. (F26, CN)

76-F. Furnaces for Shell Production. Henry M. Heyn. *Industrial Gas,* v. 30, Mar. 1951, p. 3-5, 24.

Various gas-fired furnaces used in production of high-explosive shells, for annealing, forging, and forming operations. Material is usually carbon steel. (F21, G general, J23, T2, CN)

77-F. Details of the New 42-In. Slabbing Mill Installed at the Works of John Summers and Sons Ltd. at Shotton. *Sheet Metal Industries,* v. 28, Mar. 1951, p. 219-222, 228.

British mill. (F23)

78-F. The Adherence of Oxide Scales on Copper. R. F. Tylecote. **Appendix on the Temperature of the Oxide Scale on Copper During Hot Rolling.** R. Eborall. *Journal of the Institute of Metals,* v. 78, Dec. 1950, p. 301-326.

The scales formed on pure or tough-pitch Cu and on phosphorus-deoxidized Cu are known to behave very differently during fabrication, the phosphorus-bearing coppers shedding their scales more readily than the phosphorus-free coppers during hot working. A corresponding difference is observed in laboratory tests when specimens are oxidized in air at hot working temperatures and then cooled to room temperature. These differences are explained in terms of mechanical properties of the scales at elevated temperatures. In the appendix an estimate is made of temperatures reached by the oxide scales when a slab preheated to 900° C. is passed through the rolls. Infers that moderate reductions in initial slab temperature would markedly favor exfoliation of the scale. (F23, R2, Cu)

79-F. Friction in Wire Drawing. H. G. Baron and F. C. Thompson. *Journal of the Institute of Metals,* v. 78, Dec. 1950, p. 415-462.

The magnitude of frictional loss in drawing 65-35 brass wire, using carbide dies with and without parallel extensions. Results confirm the view that the process is more efficient as reduction of area becomes larger. Coefficient of friction between the wire and die is calculated on the basis of the theories of Sachs, of Davis and Dokos, and of Hill and Tupper, respectively. Experiments with "back pull" showed that the relationship between the die load and back-pull is not strictly linear. Effects on friction of a number of variables, using a variety of lubricants. 29 ref. (F28, Cu)

80-F. Lubricants for the Cold Working of Non-Ferrous Metals. S. F. Chisholm. *Journal of the Institute of Metals,* v. 78, Jan. 1951, p. 483-500.

The processes of cold rolling, press drawing, tube drawing, and wire drawing from the point of view of the demands they make on lubricants. Suitable types of lubricant. (F1, G4)

81-F. The Cold Rolling of Non-Ferrous Metals in Sheet and Strip Form. C. E. Davies. *Journal of the Institute of Metals,* v. 78, Jan. 1951, p. 501-536.

Modern technique for rolling Cu and Cu alloys, Al and its alloys. The relative merits of 2-high and 4-high mills for various purposes, and also those of reversing, non-reversing, and tandem units. Refers to mills with minimum work-roll diameters, such as the Sendzimir mill. Considerable attention to auxiliary equipment. (F23, Cu, Al)

82-F. Wire-Drawing Technique and Equipment. F. T. Cleaver and H. J. Miller. *Journal of the Institute of Metals,* v. 78, Jan. 1951, p. 537-562.

Historical development and present-day machines of various types. Die design, die materials, lubricants, speeds of drawing, reductions, and other aspects of wire drawing, and a detailed account of current practice in the production of Cu, brass, bronze, and other Cu-alloy wires, also Al and Al-alloy wire. Various types of defects. (F28, Cu, Al)

83-F. Extruded Hollow Propeller Blades. *Automotive Industries,* v. 104, Apr. 1, 1951, p. 32-33, 74.

New production technique and equipment. Material is Cr-Ni-Mo steel. (F24, AY)

84-F. Aircraft Propeller Blades Hot Extruded Faster. *Steel,* v. 128, Apr. 2, 1951, p. 86, 88.

New process and equipment developed by Curtiss-Wright's Propeller Div., in cooperation with the U. S. Air Force. Material is Cr-Ni-Mo steel. (F24, AY)

85-F. Roll Forging Steel Rings. William H. Newsome. *Steel Processing,* v. 37, Mar. 1951, p. 126-127, 141.

Production experience in fabrication of weldless steel rings. The process consists of using steel rolls and hydraulic pressure to convert prefabricated steel "doughnuts" into rings with outside diameters of 8-76 in., weights of 50-2500 lb., and lengths up to 20 in. (F22, ST)

86-F. Cold Forming of Low-Carbon Steel. Part I. Selection of Steel for Drawing. Lester F. Spencer. *Steel Processing,* v. 37, Mar. 1951, p. 128-131, 153.

Grading of cold rolled sheet; tempers of cold rolled strip; finish of cold rolled strip; coated sheet metal; problems related to deep drawing techniques. (F23, G4, CN)

87-F. Increasing Drop Forging Die Life. Part IV. Effect of Heating Forgings. John Mueller. *Steel Processing,* v. 37, Mar. 1951, p. 132-133.

Recommendations for optimum heating times and temperatures for different carbon and alloy steel compositions. (F21, F22, AY, CN)

88-F. Operation of a Ten Inch Continuous Bar Mill. H. A. Carter. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 39-51.

At Lackawanna plant of Bethlehem Steel Co. Mill problems and limitations, and figures showing what the mill has done up to the present time. (F27, ST)

89-F. The Manufacture of Electric Welded Transmission Pipe. J. H. Middleton. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 79-90.

Mill at Republic Steel Corp. using electric fusion submerged-arc weld process. Preparation and formation of the flat plate into cylinders, welding, and finishing of the pipe. (F26, ST)

90-F. The Use of Tungsten Carbide Dies in Wire Drawing and Nail Making. Edward C. Kinyon. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 159-167.

Development of the wire drawing die, emphasizing the tremendous effect of the tungsten carbide die on the steel wire industry. (F28, T5, ST, C-n, W)

91-F. Source of Rolling Defects. (In German.) Paul Gruner and Theo Bruggemann. *Stahl und Eisen,* v. 71, Jan. 4, 1951, p. 20-28; Jan. 18, 1951, p. 71-77.

Classifies defects in rolled steel into two main classes: those caused by poor raw material and those caused by poor rolling practice. Includes numerous photographs and micrographs. 15 ref. (F23, M28, CN)

92-F. Present-Day Domestic and Foreign Construction of Rolling Mills. (In German.) Theodor Dahl. *Stahl und Eisen,* v. 71, Mar. 1, 1951, p. 229-244.

Design and operation of all sorts of rolling mills, except those used in the production of pipe. Problems for further development. 23 ref. (F23)

93-F. Electronic Shear Control. *Machine Design,* v. 23, Apr. 1951, p. 162.

New flying shear, incorporating photo-electric relays and timer circuits, which serves the dual purpose of cropping the front ends of billets and then cutting them into hot-bed lengths. (F21)

94-F. Extruding Hollow-Steel Tapered-Section Propeller Blades. *Machinery* (American), v. 57, Apr. 1951, p. 190-191.

Process applied to stainless steel blades. (F24, SS)

95-F. New 86-Inch Hot Strip Mill in Production on Pacific Coast. *Steel,* v. 128, Apr. 16, 1951, p. 82, 85.

Four-stand, 4-high unit of Kaiser Steel Corp. which supplies skelp for pipe mill at present but will furnish hot coils to a tin-plate mill when completed. (F23, AY)

96-F. Big Squeeze Applied to Airplane Propellers Cuts Production Time by Hours. *Product Engineering,* v. 22, Apr. 1951, p. 162-163.

Hot extrusion process developed by Propellor Div., Curtiss-Wright Corp. for fabrication of one-piece, hollow, stainless steel propeller blades for high-speed combat and commercial aircraft. (F24, SS)

97-F. Rolls and Rolling. Part XXIV. Angles. (Continued.) E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 39, Mar. 1951, p. 343-350.

Additional roll-pass diagrams and textural description applicable to different forms of angles. (To be continued.) (F23)

98-F. (Pamphlet) **Handbook of Cold Drawn Butt Welded Mechanical Steel Tubing.** 1950, 44 pages. Pittsburgh Tube Co., Pittsburgh.

Welding, finishing, inspection, dimensional tolerances, and physical and mechanical properties of cold drawn, butt welded steel tubing made almost exclusively of low-carbon, openhearth steel. (F26, CN)

99-F. (Book) **Metalworking Lubricants.** E. L. H. Bastian. 1951. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. $6.00.

The nature, selection, and application of lubricants and fluids. Those used in forming nonmetallic engineering materials, such as plastics, are also analyzed. New lubricants such as molybdenum disulphide, chemically active waxes, water-miscible oils for drawing fine-gage wire, and a variety of synthetic fluids and compounds are covered. (F1, G21)

G

SECONDARY MECHANICAL WORKING

128-G. Tooling for Limited Production. Gilbert C. Close. *Finish,* v. 8, Apr. 1951, p. 21-24, 88.

General principles applicable to work on experimental models or short-run production of precision parts. Analysis of tooling and tooling processes; plastics as tools; welding fixtures; and metal-forming equipment. (G general, T5)

129-G. How to Stretch-Form Magnesium. *Aviation Week,* v. 54, Mar. 19, 1951, p. 21-22.

Process developed by an aircraft manufacturer. (G9, Mg)

130-G. Hot Dimpling Widens Metal Use. *Aviation Week,* v. 54, Apr. 2, 1951, p. 21-22.

Process as applied to Al and Mg alloys, and used to prepare aircraft sheet metal for flush riveting. "Thermotronic Control Unit" developed by Aircraft Tools, Inc., Los Angeles. (G2, Al, Mg)

131-G. Flow Test of Hubbing Steel. Folke Halward. *Metal Progress,* v. 59, Mar. 1951, p. 356-358.

Hubbing (or "hobbing", as it is often called) instead of machining of cavities, is generally employed when a number of the cavities of the same size and shape are required in a single plastic mold. The method consists of forcing a hardened steel hub of the desired shape into a blank of softer steel. Design and material requirements. Simple test for determining an otherwise unknown "flow property." Proposes a "hubbing number" or index. (G16, AY)

132-G. Spinning Flanged and Dished Wrought Iron Heads. Edward B. Story. *Metal Progress,* v. 59, Mar. 1951, p. 375.

Modified procedure which gave satisfactory results. (G13, Fe)

133-G. Versatile Airplane Sub-Contracting. Howard E. Jackson. *Modern Industrial Press,* v. 8, Mar. 1951, p. 34, 36, 40, 44.

Forming, shearing, rolling, and heat treating equipment and procedures of Castle Industries, Inc., near Seattle, Wash. Miscellaneous metal parts are produced—90% for aircraft. (G general, J general, T24)

134-G. The Spinning of Steel. J. Lomas. *Machinery Lloyd* (Overseas Edition), v. 23, Mar. 3, 1951, p. 81-83.

The operation of spinning as it applies to steel, and some practical hints on the types to be used for a given job. Spinning tools and suitable materials. (G13, ST)

135-G. Reduction in Machining Time Resulting From Research. *Machinery* (London), v. 78, Mar. 15, 1951, p. 449-450, 456.

Recent example of increase in production efficiency achieved as a result of work of the Production Engineering Research Assn. with reduction in machining time for drawing dies from 53 to 22 min. Experimental procedure and results. The material was an alloy toolsteel. (G17, TS)

136-G. Shearing of Metal Blanks. T. M. Chang. *Journal of the Institute of Metals,* v. 78, Dec. 1950, p. 393-414.

Effects of clearance, tool shear, and tool curvature in the shearing of circular blanks, of cast iron, mild steel, brass, Cu, Zn, Al, and Pb, ranging in thickness from 0.036 to 0.500 in. (G15, CN, Cu, CI, Zn, Al, Pb)

137-G. The Deep Drawing and Pressing of Non-Ferrous Metals and Alloys. J. Dudley Jevons. *Journal of the Institute of Metals,* v. 78, Jan. 1951, p. 563-619.

Various methods and equipment. Tool materials and drawing lubricants. Inter-stage annealing, with emphasis on faults commonly experienced under industrial conditions and on the incidence of critical-strain crystal growth. Properties of sheet which determine its behavior under the press. Tests applicable to sheet and their limited usefulness in predicting pressworking behavior. A method for routine acceptance testing of sheet is suggested. The phenomena of stretcher-strain markings and of season-cracking. 46 ref. (G4, Q23, EG-a)

138-G. Influence of Mechanical Properties of Metals on the Efficiency of "Liquid Media" During Milling. (In Russian.) G. I. Epifanov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 21, 1950, p. 415-418.

Investigated for Al, Cu, Sn, Zn, Sb, bronze and cast iron, using butyl alcohol as the "liquid medium" (cutting fluid). Results indicated that the less plastic a metal is, the less it is subject to internal stress during cutting, the less efficient is the cutting fluid, which is a factor accelerating brittle failure. (G21, Q23)

139-G. Significant Operations on the Chrysler Torque Converter. Joseph Geschelin. *Automotive Industries,* v. 104, Apr. 1, 1951, p. 38-42, 88.

Press operations, machining, spot welding, arc welding and brazing operations. (G general, K general, Al)

140-G. How Tool Life is Affected By Heat Resisting Alloys. *Automotive Industries,* v. 104, Apr. 1, 1951, p. 52, 80, 83. (Based on one chapter of recent book on machinability research, published by Curtiss-Wright Corp.) (G17, SG-h)

141-G. Microstructure Holds Key to Speedier Metal Cutting. *SAE Journal,* v. 59, Apr. 1951, p. 38-43. (Based on "Increasing Productivity in Production Machining," by Michael Field and Norman Zlatin.)

Results of experimental work on cast irons support above statement. Data are charted and photomicrographs show six cast-iron structures in order of decreasing machinability. (G17, M27, CI)

142-G. New Cutting Torch Uses Gasoline as Fuel. *Iron Age,* v. 167, Apr. 5, 1951, p. 112.

Said to have several advantages over the oxy-acetylene torch. It is claimed to result in an overall saving of 25-30% in such operations as cutting, brazing, scarfing, and similar work. (G22)

143-G. Flame Cutting Machine Adapted for Bevelling. *Industry & Welding,* v. 24, Apr. 1951, p. 38.

In order to reclaim pipe flanges, the Macon Kraft Co., Macon, Ga., has devised a unique method of reusing them without machining. (G22)

144-G. Measuring and Interpreting the Factors in Tapping Torques. Part I. Allen J. Carruthers. *Tool Engineer,* v. 26, Apr. 1951, p. 25-27.

Relationship between efficiency of a tap and twisting effort required to turn it, and the various factors influencing the relationship. Development of improved electronic dynamometer technique for determination of forces involved. Bonded-wire electric strain gages are used to measure forces involved. Metallurgical and design factors related to the tap and to the tapping machine. (G17)

145-G. Bandsawing in Foundries. Geo. H. Sheppard. *Canadian Metals,* v. 14, Mar. 1951, p. 18-21, 24, 45-46.

Bandsawing of ferrous and nonferrous castings. Production rates, saw life, cutting techniques, and types of saws are correlated with economics of foundry practice. (G17, E24)

146-G. A Mobile Factory Produces Oil Drums. *Machinery Lloyd,* (Overseas Edition.) v. 23, Mar. 17, 1951, p. 85-88.

Welding and forming equipment and procedures of "factory" which is transported from place to place by truck. (G general, T26)

147-G. The Oxygen Lance for Burning Holes in Concrete, Minerals, and Steel. (In German.) R. Wolf and E. Zorn. *Schweissen und Schneiden,* v. 2, Dec. 1950, p. 333-338.

Various patents and publications. Theories on the method and economics of its application. 12 ref. (G22, ST)

148-G. Flame Cutting With Propane. (In German.) H. Schulz. *Schweissen und Schneiden,* v. 3, Jan. 1951, p. 2-11.

Principles of flame cutting and equipment and experiments with steel sheets 10-300 mm. thick. 12 ref. (G22, ST)

149-G. Important Recent Publications on Flame Cutting. (In German.) *Schweissen und Schneiden,* v. 3, Jan. 1951, p. 22-25.

A review. 67 ref. (G22)

150-G. Increase in the Hardness of Flame-Cut Edges and Its Removal. (In German.) Gottfried Kritzler and Hermann Thier. *Stahl und Eisen,* v. 71, Feb. 1, 1951, p. 119-124.

Spectrochemical analysis of nine alloy and plain carbon steels showed a decrease in Cr, Mn, and Si; and an increase in C and Mo. Different methods and rates of flame cutting, preheating, and annealing were investigated. 18 ref. (G22, J23, CN, AY)

151-G. Concerning Single-Term Relationships of Force and Cutting Rate for Different Types of Machining. (In Russian.) A. I. Kashirin and F. A. Barbashov. *Stanki i Instrument* (Machine Tools and Equipment), v. 21, Dec. 1950, p. 7-11.

Investigation on theoretical bases reveals possibility of reducing single-term formulas for cylindrical and face milling to a formula for a milling tool, which is a general exponential formula for all types of milling. Experimental and theoretical data are tabulated for high speed toolsteel and for hard-alloy milling of steel and cast iron. (G17, ST, CI)

152-G. Fundamentals of Processes for Rapid Cutting of Steels. (In Russian.) E. I. Feld'dshtein. *Stanki i Instrument,* (Machine Tools and Equipment), v. 21, Dec. 1950, p. 15-19.

Results of experimental investigation indicate existence of errors in previous theories, and clarify basic factors affecting tool stability during rapid cutting, which depends on microstructure. Imparting a pearlite structure to medium and high-carbon steels was effective in improving their machinability. 13 ref. (G17, CN)

153-G. How to Cut Steel. H. J. Diehl. *Welding Journal,* v. 30, Apr. 1951, p. 359-361.

Recommended techniques for oxy-acetylene cutting. (G22, ST)

154-G. Fatigue Durability of Prestressed Screw Threads. J. O. Almen. *Product Engineering,* v. 22, Apr. 1951, p. 153-156.

Beneficial effect of superficial rolling on fatigue life of screw threads; fatigue strength of screw threads before and after prestressing with rollers and devices for surface rolling of threads; design of rollers. (G23, Q7, T7, ST)

155-G. Review of Powder Cutting Processes. Part I. *Welding and Metal Fabrication,* v. 19, Mar. 1951, p. 91-98.

Procedures and equipment. (To be continued.) (G22)

156-G. Some Technical Considerations on the Coining of Metals. Paul Huguenin. *Sheet Metal Industries,* v. 28, Apr. 1951, p. 345-352, 356. (Translated from *Pro-Metal,* Apr. 1950.)

Procedures and equipment for coining of miscellaneous ferrous and nonferrous metals. 11 ref. (G3)

157-G. Improvement and Mechanization of Oxygen-Flux Cutting. (In Russian.) S. G. Guzov and O. Sh. Spektor. *Avtogennoe Delo* (Welding), v. 21, Dec. 1950, p. 24-27.

Apparatus by which additional oxygen is introduced directly into the cut by means of a special attachment. Operating characteristics are tabulated for cutting Cr steels of thicknesses up to 200 mm. (G22, AY)

158-G. (Book) **Oxygen Cutting.** G. V. Slottman and E. H. Roper. 407 pages. 1951. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. $6.50.

A comprehensive manual of practical oxygen-cutting techniques, as well as a summary of present-day knowledge of the subject. Includes extensive discussions of the many uses to which oxygen cutting can be applied, and historical background material. (G22)

159-G. (Book) **Pressworking of Metals; A Reference Book Illustrating and Describing the Uses of Metalworking Presses and Many Types of Press Tool Designs.** Ed. 2. C. W. Hinman. 551 pages. 1950. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. $8.50.

Some 600 press-tool designs, types of presses, attachments, and accessories. Their use with common materials. (G1)

H — POWDER METALLURGY

16-H. Infiltrated Iron and Steel. H. W. Greenwood. *Iron and Steel,* v. 24, Mar. 1951, p. 97-98.

Recent improvements in physical and mechanical properties of parts, in which a skeleton of iron or steel is impregnated with a low-melting-point metal. Present and potential applications. (H16, Fe, ST)

17-H. Influence of Oxide on the Pressing and Sintering of Copper Compacts. T. P. Hoar and J. M. Butler. *Journal of the Institute of Metals,* v. 78, Dec. 1950, p. 351-392.

Pressing and sintering of compacts of electrolytic Cu powder were studied with particular reference to influence of oxide. A single batch of powder was prepared, freed of oxide by hydrogen reduction and superficially oxidized to various oxygen contents ranging from 0.11 to 11.2% by controlled low-temperature treatment in oxygen. Small cylindrical compacts were pressed at 10, 20, and 30 tons per sq. in.; their densities were determined in the green state and after sintering, and their length changes during controlled heat treatment in reducing and neutral atmospheres were followed dilatometrically. (H15, H16, Cu)

18-H. The Compressibility of Iron Powder. J. Heuberger. *Engineers' Digest,* v. 12, Mar. 1951, p. 89-90. (Condensed from *Acta Polytechnica,* No. 98, 1950, p. 11-20.)

A rational formula for the relationship between die pressure and

density of the compressed powder is developed, compared with existing formulas, and tested by evaluation of experimental data. (H11, Fe)

19-H. Shell Rotating Bands Successfully Made From Iron Powders. H. R. Clauser. *Materials & Methods,* v. 33, Apr. 1951, p. 61-65.

Manufacturing process. Large-scale adoption of Fe powder rotating bands is now a definite possibility and will make possible large savings of critically short copper. (H general, T2, Fe)

20-H. Particle Agglomeration in Tungsten Metal Powder. Bernard Kopelman and C. C. Gregg. *Journal of Physical & Colloid Chemistry,* v. 55, Apr. 1951, p. 557-563.

Aggregates seen in the microscope, after tungsten powder has been carefully dispersed with a spatula, are clusters of sintered particles. These clusters may be assumed equivalent to single particles of the same diameter. (H11, W)

21-H. Electrodeposition of Copper Powder. M. V. Joshi, H. J. Modi, and G. S. Tendolkar. *Journal of Scientific and Industrial Research,* v. 10B, Feb. 1951, p. 48-49.

Modified cell and auxiliary apparatus. Operating data and results. (H10, Cu)

J

HEAT TREATMENT

90-J. Gear Hardner Loads and Unloads Automatically. Paul Good. *Iron Age,* v. 167, Mar. 22, 1951, p. 72-74.

Equipment used by Westinghouse Electric Corp. (J26, T7, ST)

91-J. Largest Automatic Gas Carburizing Installation at Warner Gear Plant. *Industrial Heating,* v. 18, Mar. 1951, p. 410-412, 414, 416, 418, 420. (J28, ST)

92-J. Ford Camshafts Flame or Induction Hardened. *Industrial Heating,* v. 18, Mar. 1951, p. 422, 424, 426, 428, 430, 554, 556.

Macrographs and micrographs show structures obtained. Material is an alloy cast iron. (J2, CI)

93-J. Continuous Annealing of Strip Steel at Dominion Foundries & Steel, Ltd. W. R. Weir. *Industrial Heating,* v. 18, Mar. 1951, p. 457-458, 460, 462, 464, 466, 468, 470, 472, 564, 566, 568, 570.

Construction, operational features, and the results obtained. Details concerning furnace atmosphere and annealing temperatures. (J23, CN)

94-J. The Heat Treatment of Narrow Steel Strip by the Electric Direct Resistance Method. O. C. Trautman. *Wire and Wire Products,* v. 26, Mar. 1951, p. 219-221.

Method which has been in use for the past two years. This new process produces strip which has higher physical properties than can be obtained by furnace heat treating. (J2, ST)

95-J. The Solar Story. *Western Machinery and Steel World,* Mar. 1951, p. 78-79.

Use of gas-fired furnaces by Solar Aircraft, San Diego, in heat treatment of high-temperature stainless steel and superalloy aircraft engine manifolds. (J general, SS, SG-h)

96-J. Steel Production in Mid-America. Arthur Q. Smith. *Industrial Gas,* v. 30, Mar. 1951, p. 14-15, 28.

Gas-fired furnaces for billet heating, wire patenting, and hot-dip galvanizing at Sheffield Steel Corp., Kansas City, Mo., Sand Springs, Okla., and Houston, Tex. (J21, J25, L16, CN, Zn)

97-J. Localized Flame Hardening of Steel Cutters Reduces Warpage. A. P. Alexander. *Materials & Methods,* v. 33, Mar. 1951, p. 76.

How satisfactory hardness was obtained and rejects reduced by selective treatment of laminated steel. The laminate consisted of layers of low-carbon and high-carbon (0.90%) steel. (J2, ST)

98-J. Brass Strip Annealed and Cleaned Continuously. *Steel,* v. 128, Mar. 26, 1951, p. 76-77.

New integrated automatic system at American Brass Co.'s new sheet and strip mill in Buffalo. (J23, L12, Cu)

99-J. Flame Hardening; Practical Applications to Steels and Cast Iron. *Iron and Steel,* v. 24, Mar. 1951, p. 107-110. (J2, CI, ST)

100-J. Stress Relief and Allied Problems in Magnesium-Alloy Castings. R. J. M. Payne. *Foundry Trade Journal,* v. 90, Mar. 8, 1951, p. 263-265.

Previously abstracted from *Journal of the Institute of Metals.* See item 49-J, 1951. (J1, Mg)

101-J. The Study of Timepiece Springs. II. (In Japanese.) Tetsutaro Mitsuhashi and Manabu Ueno. *Journal of Mechanical Laboratory,* v. 4, Sept. 1950, p. 174-179.

Heat treatment procedures for improving fatigue limit. Refers to 1948 articles in *Metal Progress.* (J26, Q7, T7, ST)

102-J. Study on Application of Material. IV. The Mechanism of Solid-State Carburization in the A-A_3 Range. (In Japanese.) Hisao Matsumoto and Motoici Kitada. *Journal of Mechanical Laboratory,* v. 4, Sept. 1950, p. 191-195.

Results of theoretical and experimental study, using various carburizers. (J28, N8, ST)

103-J. Study on Application of Material. V. Sawdust Carburization. (In Japanese.) Hisao Matsumoto and Motoici Kitada. *Journal of Mechanical Laboratory,* v. 4, no. 6, Oct. 1950, p. 236-239.

Results of study of use of sawdust as carburizing agent. (J28, ST)

104-J. Study on Application of Material. VI. Mechanism of Grain Refining by Induction Heating (Study of High-Frequency Induction Heating No. 2.) (In Japanese.) Hisao Matsumoto and Kenichi Yamashita. *Journal of Mechanical Laboratory,* v. 4, no. 6, Oct. 1950, p. 240-245.

Results for carbon steel are tabulated, charted, and illustrated by photomicrographs. (J2, CN)

105-J. Heat Treatment of Spring Steels for Watches and Clocks. (In Japanese.) Tetsutaro Mitsuhashi. *Journal of Mechanical Laboratory,* v. 4, no. 7, Oct. 1950, p. 257-262.

Scaling and decarburization, grain-growth characteristics, softening speed on tempering, and hardness change on isothermal transformation were studied for spring steels 0.4 mm. thick and containing 0.94 and 1.19% C. (J26, N3, SG-b, CN)

106-J. Mass Marquenching. W. B. Cheney and W. C. Hiatt. *Steel Processing,* v. 37, Mar. 1951, p. 135-139.

See abstract of "Mass Marquenching Speeds Gear Output," *Steel,* item 44-J, 1951. (J26, T7, AY)

107-J. Molybdenum Can Replace Chromium in Bearing Steels. A. S. Jameson, A. D. Ellis, and G. F. Meyer. *Iron Age,* v. 167, Apr. 5, 1951, p. 102-107.

By replacing 1-1.5% Cr with ½% Mo, a satisfactory substitute has been developed for the standard E52100 steel. Heat treating and annealing cycles are shorter for Mo steels. Experimental Mo-B bearing heats were also tested. Hardness vs. tempering-temperature curves, also hardenability data, for various compositions. (J general, AY, SG-c)

108-J. Effects of Some Solution Treatments Followed by an Aging Treatment on the Life of Small Cast Gas-Turbine Blades of a Cobalt-Chromium-Base Alloy. I. Effect of Solution-Treating Temperature. C. Yaker and C. A. Hoffman. *National Advisory Committee for Aeronautics,* Technical Note 2320, Mar. 1951, 37 pages.

Solution treatments at 2350, 2250, and 2100° F. followed by aging at 1500° F. Includes tables, graphs, and micrographs of results. (J27, Co, Cr)

109-J. Continuous Annealing of Strip Steel at Dominion Foundries and Steel Limited. W. R. Weir. *American Iron and Steel Institute,* "Technical Committee Activities," 1950, p. 217-232.

Previously abstracted from *Industrial Heating.* See item 93-J, 1951. (J23, CN)

110-J. Controlled Atmospheres. W. F. Ross. *Canadian Metals,* v. 14, Mar. 1951, p. 12, 14, 50.

How specific properties can be achieved by heat treatment in controlled atmospheres of special composition. Carburizing and nitriding are among the methods described. (J2, J28)

111-J. Flame Hardening of Cast Iron Surfaces. (In German.) Hans Wilhelm Grönegress. *Stahl und Eisen,* v. 71, Mar. 1, 1951, p. 246-252.

Development, present status, and future possibilities. Types of cast iron that can be hardened by this method. 27 ref. (J2, CI)

112-J. The Efficiency of Continuous Strip-Annealing Furnaces. (In German.) O. Junker. *Metall,* v. 5, Mar. 1951, p. 106-107.

Mathematics of determining efficiency. (J23)

113-J. Spoiled Tool Steels Can Be Reclaimed. R. P. Seelig. *Iron Age,* v. 167, Apr. 12, 1951, p. 97-101.

Six toolsteels were deliberately spoiled, either by quenching in the wrong medium or at incorrect temperatures. Some attained desired hardness values and bend strengths after reheating and retempering. Basic technique and required precautions. (J26, Q29, TS)

114-J. Pearlitic Malleable Irons Can Be Successfully Surface Hardened. S. H. Bush, F. B. Rote, and W. P. Wood. *Materials & Methods,* v. 33, Apr. 1951, p. 70-72.

How hard, wear resistant surfaces can be produced by flame or induction hardening, thus increasing greatly the number of possible applications of the pearlitic malleable irons. Includes photomicrographs and hardness vs. depth curves. (J2, CI)

115-J. A Note on the Measurement of Stress Relief. C. R. Tottle. *Metallurgia,* v. 43, Mar. 1951, p. 148-150.

Adaptation of a creep testing machine for measurement of stress relief during a heat treatment cycle, enabling stress, extension, and temperature to be plotted against time on the same graph. A high-duty gray cast iron, an ordinary gray cast iron, a cast steel, and a 66-34 cast brass are used to illustrate the principle. (J1, Q3, CI, Cu)

116-J. The Surface Hardening of Steel. Part III. Pack Carburising. G. T. Colegate. *Metal Treatment and Drop Forging,* v. 18, Mar. 1951, p. 103-110, 118.

Effects of time and temperature upon depth of case in pack carburizing, and causes contributing to exfoliation and formation of soft spots. Carburizing compounds, retardants and the mechanism of reactivation. 12 ref. (To be continued.) (J28, ST)

117-J. Effect of Initial Heating Temperature on the Mechanical Properties of Ni-Cr-Mo Steels. J. A. Wheeler, V. Kondic, and T. Ko. *Journal of the Iron & Steel Institute*, v. 167, Mar. 1951, p. 301-308.

Effect of high austenitizing temperature on tensile properties of air-quenched Ni-Cr-Mo steels. Transformations and precipitations involved were also investigated. (J22, Q27, N8, AY)

118-J. Development of Methods for Gas-Flame Treatment of Metals. (In Russian.) A. N. Shashkov. *Avtogennoe Delo* (Welding), v. 21, Dec. 1950, p. 5-7.

Progress of the All-Union Institute of Scientific Research on flame heat treatment of metals, including both processes and equipment. (J2)

K

JOINING

212-K. Procedure for the Welding of Staybolts. Floyd R. Seeley. *Proceedings, Master Boiler Makers' Association*, 1950, p. 98-102; disc. p. 102-109.

Recommended procedure, including preliminary steps. Experiences of different railroads. Compares results obtained with various alloy steels. Arc welding is apparently used. (K1, AY)

213-K. Special Devices up Welding Efficiency. Walter Rudolph. *Iron Age*, v. 167, Mar. 22, 1951, p. 70-71.

How maximum efficiency in heavy welding operations is obtained by good plant layout and special equipment at National Tank Co.'s new plant. Both built-in and portable setups have been designed and built to mount manual and automatic hidden-arc welding heads. This equipment simplifies and speeds heavy welding of large tanks and pressure vessels. (K1, T26, ST)

214-K. Investigation Into Automatic Three-Phase Arc-Welding. G. P. Michailov, B. S. Bril, and E. I. Bobrov. *Engineers' Digest*, v. 12, Feb. 1951, p. 56-57. (Translated and condensed.) Previously abstracted from *Avtogennoe Delo*. See item 601-K, 1950. (K1, CN)

215-K. Steel Ball Holds Nitrogen at 5500 Psi. *Aviation Week*, v. 54, Mar. 26, 1951, p. 28, 31; **Stainless Steel Fabricated from Shaped Plates**, *Steel*, v. 128, Mar. 26, 1951, p. 82; **Welded Spheres Solve Liquid Nitrogen Storage.** *Iron Age*, v. 167, Mar. 29, 1951, p. 86-88.

Welded "Nitro-Sphere" for servicing rocket-powered craft which weighs about 7500 lb., and holds 200 gal. of liquid N_2. Material is 11/16-in. stainless steel plate and the sphere is 54 in. in diameter. (K1, G1, SS)

216-K. Prefabricating Channel Tank Tops. J. W. Massenburg. *Marine Engineering and Shipping Review*, v. 56, Apr. 1951, p. 55-58.

Arc welding procedures and equipment at Rud Machine Co., Cleveland. (K1, T26, CN)

217-K. Welding Saves Structural Steel. Part I. Case Histories (anon.). **Part II. Prospects for Material and Cost Savings.** T. R. Mullen. *Architectural Record*, v. 109, Mar. 1951, p. 144-146.

Part I: pictures plus captions. Part II: economies. (K general, T26, CN)

218-K. Color-Match Welding Solves Musical Instrument Fabrication Problem. L. D. Richardson. *Materials & Methods*, v. 33, Mar. 1951, p. 82-83.

Specialized techniques used for torch welding in fabrication of brass musical instruments by F. A. Reynolds Co., Cleveland. (K2, T9, Cu)

219-K. New Welding Process Ends Limitation in Automatic Hidden Arc Welding. *Western Machinery and Steel World*, Mar. 1951, p. 81.

Patented process known as "3 o'clock" welding developed by Lincoln Electric Co. Horizontal seams are welded from both sides simultaneously. The joint is stationary as two electrodes are moved along opposite sides of work. Flux is carried on a moving belt so that it is stationary in relation to the work. (K1, ST)

220-K. Fluxless Welding With the Electric Needle at Ryan. W. P. Brotherton. *Western Machinery and Steel World*, Mar. 1951, p. 84-86.

Use of Heliarc welding by Ryan Aeronautical Co. for joining a variety of nonferrous metals and alloys. (K1, EG-a)

221-K. Spot Welding in Aircraft Construction. Fred Hemstreet. *Western Machinery and Steel World*, v. 42, Mar. 1951, p. 90-91.

Procedures for production spot welding of Al alloys at the El Segundo plant of Douglas Aircraft. (K3, Al)

222-K. Application of Down-Draft Exhaust Ventilation as Used in Automatic High-Speed Soldering of Metal Containers. E. D. Sallee and R. B. Carter. *Heating and Ventilating*, v. 48, Mar. 1951, p. 61-64.

Arrangement for local exhaust ventilation. (K7, CN)

223-K. Solders Developed That Conserve Tin. *Canadian Mining Journal*, v. 72, Mar. 1951, p. 65.

Work of Metals Conservation Committee, Federated Metals Div., American Smelting and Refining Co. Extensive research results indicate that silver is the only metal readily

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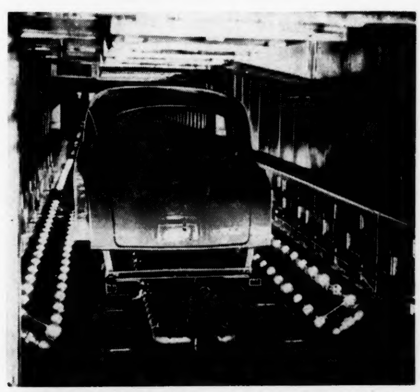

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available in volume that can be satisfactorily substituted for part of the tin in solder. (K7, Sn, Ag)

224-K. Successful Re-Design of Welded Joints to Eliminate Enamel Defects in Sheet Metal Cooker Ovens. F. J. McCulloch. *Sheet Metal Industries,* v. 28, Mar. 1951, p. 267-268, 271.
Includes diagrams and illustrations. (K general, L27, CN)

225-K. Production at the Pressed Steel Company. *Welding and Metal Fabrication,* v. 19, Mar. 1951, p. 84-90.
Welding and miscellaneous presswork at British firm which manufactures automobile bodies.
(K general, G1, CN)

226-K. A Visit to a Leading British Manufacturer: Steel Furniture Production. *Welding and Metal Fabrication,* v. 19, Mar. 1951, p. 99-100.
Spot, seam, and arc welding operations. (K1, K3, CN)

227-K. Forming Aluminium for Welding and Brazing. J. C. Bailey. *Welding and Metal Fabrication,* v. 19, Mar. 1951, p. 101-109.
Mechanical properties of Al and its various alloys. Forming methods and welding methods. Recommended designs.
(K general, F general, G general, Al)

228-K. Present Status of Brown Boveri Arc Welding Equipment. H. Kocher. *Brown Boveri Review,* v. 37, July 1950, p. 228-243.
Welding machines, welding transformers, automatic arc welders, and multi-operator arc-welding plants.
(K1)

229-K. A.C. or D.C. for Welding? H. Kocher. *Brown Boveri Review,* v. 37, July 1950, p. 244-247.
Factors to be considered in making a choice. (K1)

230-K. Automatic Arc Welding in Industry. A. Smarcan. *Brown Boveri Review,* v. 37, July 1950, p. 248-254.
The main conditions for applying automatic arc welding and some completed installations. (K1)

231-K. Chemical Composition of Austenitic Electrodes and Crack Susceptibility of Weld Deposits. R. Montandon. *Brown Boveri Review,* v. 37, July 1950, p. 255-264.
Present status of austenitic electrodes for welding low and high-alloy steels. Crack susceptibility based on the literature and on tests in Brown Boveri laboratories.
(K1, AS)

232-K. Three-Phase Arc Welding. (In Russian.) G. P. Mikhailov, A. A. Kirillova, V. V. Stepanova, and N. M. Leleko. *Promyshlennaya Energetika* (Industrial Power), v. 7, Dec. 1950, p. 9-11.
Basic principles of 3-phase arc welding, automatic 3-phase arc welding under flux, and technical-economic factors. Automatic apparatus.
(K1)

233-K. Is Furnace Brazing Just as Good? Samuel Damon. *American Machinist,* v. 95, Apr. 2, 1951, p. 98-100.
Exhaustive tests with a variety of brazing alloys on Cu, brass, and steel which indicate that furnace brazing will produce a shear strength at least as high as other brazing methods. (K8, Cu, ST)

234-K. 40 Spotwelds at Once, Electronically. Charles Studer. *American Machinist,* v. 95, Apr. 2, 1951, p. 119.
Welder that joins hot-section stiffening ribs to steel panels to make movable office walls. The unusual machine, built especially for this job, fires up to 40 welding tips in a progressive cycle; making clean, hard-to-detect joints on 3-in. centers on panels as wide as 64½ in.
(K3, ST)

235-K. Engineering Aspects of Tool and Die Welding. Part V. (Concluded.) **Oxyacetylene Welding Tools and Dies.** Arthur R. Butler. *Tool Engineer,* v. 26, Apr. 1951, p. 45-46.
(K2, T6, TS)

236-K. Slope Control Aids AC Welding of Aluminum. Charles Bruno and G. W. Birdsall. *Iron Age,* v. 167, Apr. 5, 1951, p. 100-101.
New electronic control which makes possible good-quality resistance welds with conventional single-phase 60-cycle a.c. equipment. Tip aluminum pickup is reduced, and electrode life increased 20-30 times.
(K3, Al)

237-K. 84 Complete Bodies Per Hour. Ed Nelson. *Industry & Welding,* v. 24, Apr. 1951, p. 24-26.
Procedures at Chrysler Corp., utilizing about 85% resistance, 10% metallic and inert-arc, and 5% oxyacetylene welding.
(K3, K1, K2, T21, CN)

238-K. The Silver Brazed Pipe Line. John B. Ross. *Industry & Welding,* v. 24, Apr. 1951, p. 44-46, 78-79.
Procedure and application to Cu and steel water, gas, and fuel lines.
(K8, CN, Cu)

239-K. Thermit Takes Over Where a Foundry Leaves Off. *Industry & Welding,* v. 24, Apr. 1951, p. 58, 84.
Use of thermit welding to put a new ingot-stripper stand housing into service for a large steel plant in the Pittsburgh district.
(K4, CN)

240-K. Booster Simplifies Welder Design. *Applied Hydraulics,* v. 4, Apr. 1951, p. 28-29.
Airdraulic cylinder on a special spot welding machine which permits use of smaller gun units and reduces the number of components in the power circuit. (K3)

241-K. Metal Adhesive Processes. F. H. Parker. *Journal of the Royal Aeronautical Society,* v. 2, Feb. 1951, p. 153-167; disc. p. 167-168.
Practical aspects of the method.
(K12)

242-K. What is the Mechanism of Bonding of Metals During Welding or Soldering? (In German.) C. Keel. *Zeitschrift fur Schweisstechnik, Journal de la Soudure,* v. 41, Jan. 1951, p. 2-6; Feb. 1951, p. 30-35.
Attempts are made to answer the question on the basis of fundamental metallurgical principles. Micrographic study reveals typical differences characterizing various forms of bonds between metals. 18 ref.
(K general)

243-K. Hard-Soldering in Mass Production. (In German.) Hugo Frostne. *Schweisstechnik,* v. 5, Jan. 1951, p. 4-8. (From *AGA-Svetsning* (Stockholm), June 1948.)
Principles, processes, and equipment. Diagrams show recommended joint designs; also construction of equipment for production-line hard soldering. (K7)

244-K. Welding Malleable Iron. (In German.) F. Roll. *Giesserei,* v. 38 (new ser., v. 4), Feb. 22, 1951, p. 86-88.
Methods for welding white and black malleable iron and the possibility of machining the welded parts. Includes an outline of specifications.
(K general, CI)

245-K. Welding Cast Iron Parts of Heating Boilers. (In German.) H. A. Horn. *Schweissen und Schneiden,* v. 3, Jan. 1951, p. 11-17.
Economy of the process, difficulties involved, procedure, and precautions to be taken to prevent weld cracking. (K general, T25, CI)

246-K. Application of the Ellira Welding Process in Machine Construction. (In German.) Th. Hövel. *Schweissen und Schneiden,* v. 3, Jan. 1951, p. 17-21.
Equipment for submerged-melt welding process. Practical examples of how to make good welds in thick and thin steel plate. (K1, ST)

247-K. Smoke in Arc Welding. W. Hummitzsch. *Welding Journal,* v. 30, Apr. 1951, p. 323-324. (Translated and condensed from *Schweisstechnik,* v. 4, Nov. 1950, p. 121-130.
Data on gases evolved from electrode coatings. Compositions of smokes and slags from different types of electrodes. Refers to 1946 paper by Mallett and Rieppel. (K1)

248-K. Welding of High-Temperature, High-Pressure Piping. Louis C. McNutt. *Welding Journal,* v. 30, Apr. 1951, p. 325-330.
Fabrication and welding procedures successfully used on six groups of alloy-steel compositions for high-temperature service. Includes photomicrographs.
(K general, AY, SG-h)

249-K. Welding Aluminum Alloys. G. O. Hoglund. *Welding Journal,* v. 30, Apr. 1951, p. 331-346.
Fundamental and practical considerations, including properties, procedure, inspection, design, and applications. (K1, K2, K3, Al)

250-K. Applications of Welded Design for Cost Reduction. R. H. Bennewitz. *Welding Journal,* v. 30, Apr. 1951, p. 347-357.
Principles of good welding design including a statement of advantages of welding, selection of material, production requirements, equipment, joint design, fixtures, and costs.
(K general)

251-K. Making Lead Pipe Joints. L. S. Bowser. *Welding Journal,* v. 30, Apr. 1951, p. 362-363.
Torch welding procedures.
(K2, Pb)

252-K. Welded Reinforcement of Openings on Structural Steel Members. D. Vasarhelyi and R. A. Hechtman. *Welding Journal,* v. 30, Apr. 1951, p. 182s-192s.
Determination of the effectiveness of three types of arc welded reinforcement, face bars, single doubler plates, and insert plates, for circular, square-with-rounded-corners, and square-with-sharp-corner openings.
(K1, T26, CN)

253-K. Evaluation of Welded Ship Plate by Direct Explosion Testing. G. S. Mikhalapov. *Welding Journal,* v. 30, Apr. 1951, p. 195s-201s.
Evaluation of relative notch sensitivity of two grades of ship plate when welded with several processes and procedures. (K9, Q23, CN)

254-K. Studwelding Slashes Fabrication Time. C. H. Creasser. *Iron Age,* v. 167, Apr. 12, 1951, p. 110-111.
How Combustion Engineering-Superheater, Inc., slashes assembly time for large powerplant equipment by use of end-welded studs. This method permits placing studs as fast as 5 per min. A unique aligning device aids accuracy and speed.
(K1, ST)

255-K. Silver Alloy Brazing a Versatile Joining Method. A. Stanley Cross, Jr. *Materials & Methods,* v. 33, Apr. 1951, p. 82-85.
Recommendations for selection of the proper Ag brazing alloy and flux from among the many available; also correct design procedures. Information is correlated in tabular form. (K8, Ag, SG-f)

256-K. Hidden Arc Welding of High Pressure Piping. C. G. Herbruck. *Petroleum Engineer,* v. 23, Apr. 1951, p. D20, D22.
Procedures and equipment; advantages. (K1, ST)

257-K. Slip of Structural Steel Double-Lap Joints Assembled With High-Strength Bolts. Part I. Effect of Bolt Tension and Faying Area Upon Slip. D. R. Young and R. A. Hechtman. *Trend,* v. 3, Apr. 1951, p. 24-27, 32.
23 tests of plain carbon structural steel double-lap joints assembled with high-strength steel bolts.

All joints were tested in tension. Relative movement, or slip, of the lap plates with respect to the center plate was measured at various increments of load. (K13, CN)

258-K. A Simple Method for Butt Welding Fine Wires. Maurice Spielman. *Review of Scientific Instruments,* v. 22, Mar. 1951, p. 216-217.

Simple method of butt welding fine thermocouple wires and of joining wires of different diameters. By this method, 40-gage Chromel and Alumel wires (0.0031 in. in diam.) can be successfully butt welded and also joined to 18-ga. wire (0.040 in. in diam.). In addition, 30-ga. Cu and constantan wires (0.0100 in. in diam.) can be easily welded. (K6, Cu, SG-a)

259-K. The Uses and Abuses of Arc-Welding Electrodes. I. C. Fitch. *Sheet Metal Industries,* v. 28, Apr. 1951, p. 361-365, 369.

Recommendations for storage of electrodes, working conditions, surface preparation of metals, welding current and heat, joint preparation, also for the welding process as applied to broad types of steels. (K1, ST)

260-K. Welding Large Pieces by the Thermit Process. (In German.) W. Ahlert. *Schweissen und Schneiden,* v. 3, Feb. 1951, p. 40-52.

Variations of the process as applied to various ferrous and nonferrous metals, chemistry and metallurgy of the process. Procedure, equipment, treatment of the weld, its appearance, and properties. (K4)

261-K. Advances in the Field of Welding and Cutting; Recent Publications on Soldering. (In German.) *Schweissen und Schneiden,* v. 3, Feb. 1951, p. 63-64.

62 references. (K7)

262-K. Evaluation of Strength of Spot Welds According to Their Appearance. (In Russian.) E. A. Greil. *Avtogennoe Delo* (Welding), v. 21, Dec. 1950, p. 10-13.

Method developed for estimating strength of spot welds in sheet steel made from both sides, using two sizes of electrodes. It was found that diameter of the zone of irridescence may serve as the quality index, washout-out or non-circular irridescent zones indicating incorrect heat release during welding. (K9, K3, CN)

263-K. Welding of the Aluminum-Magnesium Alloy AMG-5. (In Russian.) A. V. Mordvintseva. *Avtogennoe Delo* (Welding), v. 21, Dec. 1950, p. 13-16.

Feasibility of welding Al alloy sheet containing 4.25-4.5% Mg, 0.48% Mn, 0.26% Si, and 0.34-0.37% Fe by argon-arc or gas welding or by arc welding using a metallic electrode. Complete applicability of these two methods. Mechanical properties of welds obtained. (K1, K2, Al)

264-K. Mechanism of Fusion of Weld-Deposited Metal. (In Russian.) V. A. Lapidus. *Avtogennoe Delo* (Welding), v. 21, Dec. 1950, p. 16-20.

Fusion of coated electrodes for welding of steel and chemical and physical processes involved in formation of molten droplets on the ends of the electrodes, their detachment, and union with the base metal were investigated photographically and analytically. Method of investigation and results. (K1, ST)

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CLEANING, COATING AND FINISHING

221-L. What Are the Advantages of Special Coating the Interior of Boilers and Tenders as Well as the Exterior of Flues and Tubes? Edward H. Heidel. *Proceedings, Master Boiler Makers' Association,* 1950, p. 132-138; disc. p. 138-145.

Atmospheric and interior boiler-water corrosion and experiences of different railroads. Recommended procedure for application of protective paint coatings. Requirements which suitable coatings for the different locations must fulfill. (L30, R3, R4, ST)

222-L. Plated Aluminum. M. G. Corson. *Metal Progress,* v. 59, Mar. 1951, p. 412, 414. (Translated and condensed from "Influence of Hard Chromium Plating on the Fatigue Strength of Aluminum Alloys", Ernst Raub.)

Previously abstracted from *Metallforschung.* See item 8-166, 1947. (L17, Q7, Al, Cr)

223-L. Coatings for Protection of Steel in Water. G. W. Oxley. *Paint and Varnish Production,* v. 41, Mar. 1951, p. 10-13.

Variable conditions in underwater service; types of coatings for such service; and results of laboratory and field experiments on various types. Use of bituminous coatings. 14 ref. (L26, ST)

224-L. The Role of the Vehicle in Paints for Submerged Surfaces. A. C. Elm. *Paint and Varnish Production,* v. 41, Mar. 1951, p. 14-16, 36-37.

Previously abstracted from *Paint, Oil & Chemical Review.* See item 198-L, 1951. (L26)

225-L. Importance of Surface Preparation for the Protection of Metals. A. J. Liebman. *Paint and Varnish Production,* v. 41, Mar. 1951, p. 18-22, 37.

See abstract of "Surface Preparation Values and Sandblasting Economics," *Organic Finishing,* item 825-L, 1950. (L10, CN)

226-L. Protective Coating for Submersible Type Transformers and Network Protectors. V. A. Veit. *Paint and Varnish Production,* v. 41, Mar. 1951, p. 24-28.

Equipment is installed in street manholes and the paint coatings fail quite rapidly because of salt used to clear ice and snow. Materials of construction are mild steel or Cu-bearing steel. Special paint-test procedure developed, also some experiments with cathodic protection. (L26, R10, ST)

227-L. The Manufacture of Metal Diaphragms Having Very Accurate Perforations. D. C. Gresham. *Process Engraver's Monthly,* v. 58, Feb. 1951, p. 42, 45.

Process as applied to Cu sheets about 0.012 in. thick. The sheets are first coated with bakelite resin and bichromated gum, then placed between two negatives of the design to be etched, and exposed to high-intensity light source. Unprotected areas of resin are dissolved leaving a resin resist on both sides, where the holes are to be made. A thin layer of Ni is then electrodeposited on the unprotected areas of Cu, followed by removal of the resin resist in boiling caustic. Finally, the plate is put in a Cu-plating bath which etches the spots not previously plated with Ni through from both sides until the desired holes are produced. (L17, L26, Cu)

228-L. Derusting Equipment in the Field. The Use of Iodine as a Pickling Acid Inhibitor. Karl F. Hager and Morris Rosenthal. *Ordnance,* v. 35, Mar.-Apr. 1951, sec. 1, 479-480.

Experiments show that small ordnance items may be derusted quickly and easily even under field combat conditions. Tincture of iodine or iodine crystals are added to H_2SO_4 solution. Other acids may be substituted. (L12, Fe, ST)

229-L. Industrial Uses of Ultrasonics. G. E. Henry. *General Electric Review,* v. 54, Mar. 1951, p. 32-35.

Various possible fields of application, with special attention to the industrial cleaning of metal parts. (L12)

230-L. Data on Dry Coloring Metallics. Lawrence S. Krieger. *Plastics Industry,* v. 9, Mar. 1951, p. 20.

Dry coloring of metallic powders has been somewhat retarded because of belief that they are explosive. If the proper metallic pigment is used, and toned to the color desired with the correct pigment toners, and each particle of this mixture is coated with the proper wetting agent for insurance against sparking, no trouble will be encountered. (L26, H11)

231-L. Studies on Fishscale of Porcelain Enamel. Ikutaro Savai, Megumi Tashiro and Tadashi Yasui. *Finish,* v. 8, Apr. 1951, p. 33-37.

In order to produce "fish scales" artificially, the authors treated steel plate, one side of which was coated with different kinds of enamels, with H_2SO_4. The volume of hydrogen liberated at the enameled side was measured by displacement of mercury. Tests were made with ground coat, antimony, and titanium cover coat applied over ground coat, each with different application weights. (L27, CN)

232-L. Effect of Bath Composition on Aluminum Coatings on Steel. D. O. Gittings, D. H. Rowland, and J. O. Mack. *Industrial Heating,* v. 18, Mar. 1951, p. 448, 450, 452. (A condensation.)

Previously abstracted from *American Society for Metals,* Preprint No. 3, 1950. See item 741-L, 1950. (L16, ST, CN, Al)

233-L. Flow Coating in the Home Appliance Field. C. O. Hutchinson. *Finish,* v. 8, Apr. 1951, p. 26-28, 59.

The process, materials and equipment requirements, and control factors. (L26)

234-L. Keep It Clean. *Modern Industry,* v. 21, Mar. 15, 1951, p. 52-54.

Mechanized methods for degreasing, blasting, washing, pickling, etc., of metal parts. (L10, L12)

235-L. Finishing Floor Registers and Grilles at the Auer Register Company. Ezra A. Blount. *Products Finishing,* v. 15, Mar. 1951, p. 10-19.

Equipment and procedures for spraying synthetic enamel. The products are fabricated from steel, monel metal, aluminum, bronze, or stainless steel. (L26, ST, Ni, Al, Cu, SS)

236-L. The Electrodeposition of Iron. A. D. Squitero. *Products Finishing,* v. 15, Mar. 1951, p. 22-24, 26, 28, 30, 34, 36, 38, 40, 42, 44.

Methods, for bath compositions and operating conditions; applications. It can replace Ni and Cu in many applications for electroforming, salvage, repair, wear resistance, and as an undercoating for other deposits. 11 ref. (L17, L18, Fe)

237-L. Fundamentals of Electrocleaning. Allen G. Gray. *Products Finishing,* v. 15, Mar. 1951, p. 54, 56, 58, 60, 62, 66, 68, 70. (Based on paper by Gerald A. Lux.)

Basic requirements of a good electrocleaner; proper methods for its use. (L13)

238-L. The Use of Ethyl Silicate in Providing Heat-Resistant Coatings of Aluminium on Steel. G. Tolley. *Journal of Applied Chemistry,* v. 1, Feb. 1951, p. 86-90.

The doping of sprayed Al with ethyl silicate was found to give a heat resistant coating which needs no heat treatment before putting into service. This coating is compared with aluminizing, and the relative protection given by these two coatings to mild steel from 700 to 950° C. was determined. (L23, Al, ST)

239-L. Primer Paints for Structural Steel. S. C. Frye. *American Paint Journal,* v. 35, Mar. 26, 1951, p. 70-71, 74-75.

Includes surface-preparation recommendations. (L26, CN)

240-L. Finishing Military Aircraft. Part III. Priming and Painting. Gilbert Close. *Industrial Finishing,* v. 27, Mar. 1951, p. 52-54, 56, 58, 60, 62.

Recommended procedures. Special requirements intrduced by high air velocities and extreme temperatures. (L26)

241-L. Bakes Different Finishes on Variety of Metal Parts. Harry Miller. *Industrial Finishing,* v. 27, Mar. 1951, p. 66-68.

Oil-burner parts made of sheet steel, sheet Al, and cast Al are cleaned, painted in one of three different finishes; all are sent through the same oven, some at one level, others at another, to take care of the different baking heats required. (L26, ST, Al)

242-L. Heat Resistant Ceramic Coatings Permit Substitutes for Critical Materials. Dwight G. Bennett. *Materials & Methods,* v. 33, Mar. 1951, p. 65-67.

Recently developed ceramic coatings which make possible the high-temperature use of noncritical iron and low-carbon steel, and provide additional protection for heat resistant alloys. (L27, CI, CN)

243-L. Preparing Zinc-Base and Aluminum-Base Die Castings for Finishing. D. F. Seymour. *Materials & Methods,* v. 33, Mar. 1951, p. 68-69.

Recommendations for cleaning and surface conditioning of die-cast parts, which is frequently required before finishing to improve corrosion resistance or appearance. (L12, Zn, Al)

244-L. Heat Reflected and Conserved by Aluminum Paint Coatings. G. M. Babcock and F. B. Rethwisch. *Heating and Ventilating,* v. 48, Mar. 1951, p. 68-69.

Value of Al paint coatings for heat reflection and conservation. (L26, Al)

245-L. High Vacuum Evaporated Optical Coatings. Robert E. Frazer. *Instruments,* v. 24, Mar. 1951, p. 284-285, 322-324.

Methods for producing metallic mirrors by vacuum evaporation and deposition. Corrosion resistance, mechanical stability, and reflectivity of the various types. (L25)

246-L. Electric Metallic Tubing Given Protective Coatings. *Iron Age,* v. 167, Mar. 29, 1951, p. 96.

Steel conduit is now being given a complete exterior and interior surface finish at the Etna, Pa., plant of National Supply's Spang-Chalfant Division. Exterior coating is electroplated Zn; interior coating is sprayed lacquer. (L17, L26, ST, Zn)

247-L. Swirl Method for the Evaluation of Metal Cleaners. Robert H. Tiers. *Metal Finishing,* v. 48, Sept. 1950, p. 56-60.

Test procedure. Development of a standard "soil." Soil mixtures are applied to weighed steel panels. After re-weighing the panels plus soil, they are attached to a shaft which is rotated by a small motor. The panels are rotated in a solution of the cleaner to be evaluated. Soil weight loss is determined and computed as percentage. (L12)

248-L. Water Displacing Fluids. *Metal Finishing,* v. 48, Sept. 1950, p. 61-63.

Platers who have used these materials have found them indispensable in overcoming certain production problems. Application to plating and finishing procedures. Apparatus. (L17)

249-L. A Plating Success Story; Harding Manufacturing Company. Edward Finnie. *Metal Finishing,* v. 48, Sept. 1950, p. 64-65, 83.

Equipment and procedures of Detroit firm for plating of Al, Ni, Cr, Zn, Cd on miscellaneous parts and equipment. (L17)

250-L. Complex Compounds in Industrial Electroplating. Part II. Seymour Senderoff. *Metal Finishing,* v. 48, Sept. 1950, p. 71-78.

Comprehensive review of the role of complex compounds in Cr, Zn, Cd, Sn, Pb, In, Ag, Au, Pt, Rh, brass, speculum (Sn-Cu), terne plate (Pb-Sn), and miscellaneous alloy plating. Topics for further study. 97 ref. (L17, EG-a)

251-L. Calculating Metal Cost in Copper Plating. *Metal Finishing,* v. 48, Sept. 1950, p. 84.

A chart. (L17, Cu)

252-L. Barrel Plating of Lead-Tin Alloys. L. H. Seabright. *Metal Finishing,* v. 48, Oct. 1950, p. 54-56, 72.

Recommended bath compositions and operating conditions for deposits varying from 5-95 to 60-40 Sn-Pb. Solution-control analytical methods. (L17, Pb, Sn)

253-L. Practical Electropolishing of Stainless Steel. Fred G. Brune. *Metal Finishing,* v. 48, Oct. 1950, p. 57-62, 112. (L13, SS)

254-L. Continuous Galvanizing by the Sendzimir Process. K. Oganowski. *Metal Finishing,* v. 48, Oct. 1950, p. 63-68.

See abstract of "Armco Takes Wraps Off Sendizimir Galvanizing Process," *Iron Age,* item 391-L, 1950. (L16, Zn, ST)

255-L. Sprayed Metal Coatings for Corrosion Protection. G. Tolley. *Metal Finishing,* v. 48, Oct. 1950, p. 69-72.

Separate sections deal with sprayed Zn, Cd, and Al coatings. Other sprayed-metal coatings are briefly mentioned. (L23, Zn, Cd, Al, ST)

256-L. The Navy's Newest Electroplating Shop. George W. Grupp. *Metal Finishing,* v. 48, Nov. 1950, p. 56-57.

Shop at the U. S. Ordnance Test Station, Inyokern, Calif. (L17)

257-L. Vacuum Plating of Metals and Plastics. T. M. Navoy. *Metal Finishing,* v. 48, Nov. 1950, p. 58-60.

Fundamental principles, procedures, equipment and its maintenance, and costs. (L25)

258-L. New Hard Finish for Aluminum Alloys. *Metal Finishing,* v. 48, Nov. 1950, p. 61-63, 74.

Electroplating procedure known as "MHC" developed at Glenn L. Martin Co., Baltimore, for supplying a nonmetallic, file-hard, highly heat-refractive surface to a wide variety of Al alloys containing less than 5% Cu. Composition of the deposit or of the plating bath is not disclosed. Properties and applications of the coating. (L17, Al)

259-L. The Dressing, Heading and Care of Polishing Wheels. A. M. Brown. *Metal Finishing,* v. 48, Nov. 1950, p. 64-67. (L10)

260-L. Additive Compounds in Electroplating Baths. Part III. Marvin Rubinstein. *Metal Finishing,* v. 48, Nov. 1950, p. 68-74.

Mechanics of operation of wetting agents, addition salts, and sequestering agents. (To be continued) (L17)

261-L. Development of Metal Cleaners Using Radioisotopic Evaluation Methods. J. C. Harris and R. E. Kamp. *Metal Finishing,* v. 48, Nov. 1950, p. 75-78.

Radioisotopic tracer method for determination of soil removal combined with a dilution technique which has proved suitable for the evaluation of combinations of various surface-active agents and alkalies. (L12)

262-L. Electroplating on Aluminum. R. H. Keller. *Metal Finishing,* v. 48, Dec. 1950, p. 56-64.

History of commonly used methods for the benefit of the practical plater, theory of the processes used, and some of the difficulties encountered. 45 ref. (L17, Al)

263-L. Silvering Plastics. Isidore Cross. *Metal Finishing,* v. 48, Dec. 1950, p. 77-81.

Two methods are by simultaneous spraying of ammoniacal $AgNO_3$ and a suitable reducer through a dual-nozzle air gun; and by immersion in a solution containing the same materials. The finish produced is known as a silver mirror. Equipment and solution recipes. (L16, L23, Ag)

264-L. Hot-Dip Galvanizing of Powder Iron Compacts. H. Bablik, F. Götzl and P. Kukaczka. *Sheet Metal Industries,* v. 28, Mar. 1951, p. 277-281.

Experimental work using samples which contained 0-0.9% C. 18 photomicrographs show structures of the bonds obtained under different circumstances. Procedures found to give satisfactory results. (L17, Zn, Fe)

265-L. Some Details of Lithographical Reproduction on Vitreous-Enamelled Surfaces in Monochrome and Multicolour. A. J. Dodd. *Sheet Metal Industries,* v. 28, Mar. 1951, p. 282-287. (L27)

266-L. Steel Pellets. J. E. Hurst. *Iron and Steel,* v. 24, Mar. 1951, p. 87-88.

British hard-drawn product for cleaning and peening. (L10, G23, ST)

267-L. Metal Colouring; Methods of Treatment for Aluminium and its Alloys. C. Harris. *Metal Industry,* v. 78, Mar. 9, 1951, p. 183-185. (L14, Al)

268-L. From a Metallurgist's Notebook: Defective Silver-Plated Spoons. H. H. Symonds. *Metal Industry,* v. 78, Mar. 16, 1951, p. 205-207.

Methods of examination used to trace the cause of defective areas on silver-plated spoons. Includes micrographs. (L17, Ag)

269-L. Detergency in Electroplating. Foster Dee Snell. *Metal Industry,* v. 78, Mar. 16, 1951, p. 211-213.

Current practice in the use of alkaline, emulsion, and solvent cleaners in the American metal-finishing industry. 15 ref. (L12)

270-L. The Formulation of Anti-Corrosive Compositions for Ship's Bottoms and Underwater Service on Steel. *British Iron and Steel Research Association,* First Report of Joint Technical Panel N/P2, Jan. 1950, 26 pages.

Follows up the work of Fancutt and Hudson on anti-corrosive compositions with an investigation of new formulations designed to combine the advantages of the two most promising compositions. Protective properties and adaptability of compositions for applications to new construction. Deals with anti-corrosive compositions pigmented with combinations of basic lead sulfate/white lead/extender and basic lead sulfate/Al-powder/extender. Tests were made to develop a standard surface-preparation procedure for steel specimens used for the trials. (L26, CN)

271-L. Spectrographic Analysis of Surface Metallic Layers Obtained by Thermal Diffusion of Chromium in Iron and Steel. (In French.) Frima Malamand. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 15, 1951, p. 236-238.

Charted data for Cr content vs. depth correspond very closely to theoretical calculation on the basis of diffusion theory for commercial conditions of chromizing (vapor phase at 1100° C.). (L15, Fe, ST, Cr)

272-L. A Study of the Electrostatic Spray-Coating Process. Part I. (In Japanese.) Susumu Yoshida, Shigetake Okamoto, and Kiyoshi Tamura. *Journal of Mechanical Laboratory,* v. 4, No. 6, Oct. 1950, p. 224-231.

Experimental work to determine fundamental conditions for carrying out the process and to investigate its mechanism. Samples were rectangular metallic plates, pipes, and various parts of bicycle bodies. It was found that efficiency of spraying could be raised to as high as 50-60% with an electrostatic field, as compared to 20-30% without field. Influences of electrostatic field on hardness, adhesion, and gloss of paint films. Size distribution of paint particles which had passed through an electric field was determined by means of a string electrometer. 10 ref. (L26)

273-L. The Barrel Plating Method for Chromium. I. Research on the Plating Solution. (In Japanese). Matsuhei Kishi. *Journal of Mechanical Laboratory,* v. 4, No. 6, Oct. 1950, p. 232-235. (L17, Cr)

274-L. Metal Evaporator Uses High-Frequency Heating. Robert G. Picard and J. E. Joy. *Electronics,* v. 24, Apr. 1951, p. 126-128.

Elimination of conventional metal-heating filament makes it possible to convert more metals to the vapor state and deposit them on nonconducting materials. Surface contamination is avoided. Further progress depends on the development of better crucibles. (L25)

275-L. Spray Painting of Royal Vacuum Cleaners. W. A. Raymond. *Organic Finishing,* v. 12, Mar. 1951, p. 17-18, 21.

How metal parts of widely varying shapes can be spray painted automatically and economically. (L26)

276-L. Baking Finishes by Induction Heating. Frank Netschert. *Organic Finishing,* v. 12, Mar. 1951, p. 23-24.

See abstract of "Finishes Successfully Baked on Nonferrous Products by Induction Heating," *Materials & Methods,* item 701-L, 1950. (L26, Al, Cu)

277-L. What Platers Can Do About the Nickel Shortage. *Steel,* v. 128, Apr. 2, 1951, p. 81-83.

Substitute plating and coating techniques available where restrictions on Ni for plating make conventional Cu-Ni-Cr finishes impossible. (L17, Ni)

278-L. Chemical Deposition of Silver on Nonconductive Bodies. John T. Owen. *Plating,* v. 38, Apr. 1951, p. 353-357.

As accomplished by the spray method. Because of the analogies, the preparation of solutions and objects for other methods is also described. (L23, Ag)

279-L. Cleaning and Preparation of Metals for Electroplating. II. Soiling and Cleaning Procedures. Henry B. Linford and Edward B. Saubestre. *Plating,* v. 38, Apr. 1951, p. 367-375.

Nature of the problem of soiling and cleaning metals in the laboratory. The cleaners, soils, and metals to be used; shape and size of panels used and the equipment necessary for the preparation of the samples. A standardized process for pre-cleaning, soiling, and cleaning panels prior to testing. Gravimetric data on amount of soil present under standard conditions, and effect of several operating variables. (L12)

280-L. Makes a Big Business of D-Enameling. Arthur M. Lander. *Ceramic Industry,* v. 56, Apr. 1951, p. 102-103, 163.

Enamel stripping process and equipment used by New Process D-Enameling Corp., Chicago. They provide an enamel-removal service for rejects of other manufacturers. (L12)

281-L. The Electrodeposition of Copper-Lead Alloys. A. L. Ferguson and Nelson W. Hovey. *Journal of the Electrochemical Society,* v. 98, Apr. 1951, p. 146-154.

A number of solutions from which Cu-Pb alloys might be deposited were investigated. The most promising of these, a cyanide-tartrate solution, was studied in detail. Effects on alloy composition, single-metal potentials, and alloy potentials were determined for all of the possible variables, using a rotating-cathode setup. 11 ref. (L17, Cu, Pb)

282-L. Aging Effects in Copper-Lead Alloy Plating Solutions of the Cyanide-Tartrate Type. Nelson W. Hovey, Albertine Krohn, and A. L. Ferguson. *Journal of the Electro-Chemical Society,* v. 98, Apr. 1951, p. 155-159.

Studied during a 50-day period by measurements of single-metal potentials, static and dynamic alloy potentials, oxidation-reduction potentials, alloy compositions, and absorption spectra of the plating solution. Similar measurements on a portion of the solution stored under nitrogen established atmospheric oxidation as the cause of aging. (L17, Cu, Pb)

283-L. Cost-Saving Tips on Blast Cleaning. *SAE Journal,* v. 59, Apr. 1951, p. 46-48. (Excerpts from "Operation of Blast Cleaning Equipment," Max R. Wiard.)

Recommendations based on experiences of Campbell, Wyant & Cannon Foundry Co. (L10)

284-L. Phosphating Cleaner Cuts Finishing Costs. *Iron Age,* v. 167, Apr. 5, 1951, p. 108.

Use of material known as Klem-Kote, which cleans metal, and deposits a phosphate coating at the same time. (L12, L14, CN)

285-L. Electrically Fired Galvanizing. C. C. Roberts. *Instrumentation,* v. 5, 1st qtr. 1951, p. 33-34.

Equipment and temperature controls. (L16, Zn, ST)

286-L. Porcelain Enamel as a Corrosion Resistant Coating for Metals. G. H. McIntyre. *Corrosion* (Technical Section), v. 7, Apr. 1951, p. 118-122; disc. p. 122-123.

Use of porcelain enamel as a decorative finish as contrasted to its more recent use as a corrosion resistant coating. Properties of different types of enamels as regards methods of application and resistance to acid, weather, water, inorganic salts, and other chemicals. Some specific applications for corrosion resistance. Resistance to impact damage. (L27, R general, CN)

287-L. Coated Abrasives in the Grinding & Polishing of Stainless Steel. Part A. Prior to Fabrication. *Electroplating and Metal Finishing,* v. 4, Mar. 1951, p. 77-80.

Sheet, bar, strip, cylinder, and tube forms. Recommendations for abrasive selection, equipment, and procedures. (L10, SS)

288-L. Molybdenum in Metal Spraying by the Wire Process. Part 2. R. Corbett. *Electroplating and Metal Finishing,* v. 4, Mar. 1951, p. 84-88.

The adhesion of sprayed steel to Mo coatings, the heat treatment of Mo coatings, and the spraying of Mo onto base metals other than steel. Includes photomicrographs. (L23, Mo, ST)

289-L. Periodic Reverse Plating of Nickel and Cobalt. *Electroplating and Metal Finishing,* v. 4, Mar. 1951, p. 89-90.

A process using a cathodic time interval of about 1/5 sec. and an anodic interval of about 1/25 sec. (L17, Ni, Co)

290-L. Electrogalvanising and Painting Steel Window Frames. Alan Smart. *Electroplating and Metal Finishing,* v. 4, Mar. 1951, p. 95-96; disc. p. 96-97.

A Scottish plant illustrates factors influencing the design of automatic plating plant. (L17, L26, ST)

291-L. Recent Metallizing Developments. Thomas A. Dickinson. *Steel Processing,* v. 37, Mar. 1951, p. 122-125.

An illustrated survey. (L23)

292-L. Removal of Scale by Using Induction Heat. C. O. Parish and H. F. Kincaid. *Steel Processing,* v. 37, Mar. 1951, p. 140.

Technique for removing scale rapidly from round steel bars with induction heat. Coil arrangement and mechanized conveyor for automatically moving bars through the inductor where the surface is exposed to induced high-frequency currents. (L10)

293-L. Aluminum Coating on Steel. *Canadian Metals,* v. 14, Mar. 1951, p. 39-40.

Coatings formed by hot dipping, spraying, calorizing, cladding, and casting (Alfin process). (L general, Al, ST)

294-L. Metal Finishing Plastics by Vacuum Coating. L. Holland. *British Plastics,* v. 24, Mar. 1951, p. 96-102.

Equipment, the process and typical applications. 20 ref. (L25)

295-L. Selection of Materials for Anodizing (In French and German.) E. Zurbrügg. *Aluminium Suisse,* Jan. 1951, p. 17-26.

The Al alloy to be anodized depends on the prime purpose of anodizing and the ultimate use of the product. Includes photographs in black-and-white and in color. (L19, Al)

296-L. Modern Methods of Copper Plating Iron and Steel and of Nickel Plating Copper Alloys (Copper, Brass, Bronze). (In French and German.) Roger Zirilli. *Pro-Metal,* v. 4, Feb. 1951, p. 778-792.

Preliminary surface preparation of the articles to be plated; advantages and disadvantages of acid and cyanide baths; purpose of Cu plating as a base for Ni plating; plating equipment; thickness of Cu plate; the Cu plating of porous materials; final treatment of Cu plated articles, and a tabular list of defects, possible causes, and remedies. (L17, Cu, Ni, Fe, ST)

297-L. Insulation of Magnetic Sheet Metal by Means of a Mica-Phosphate Layer (In German.) A. Wüstefeld. *Werkstoffe und Korrosion,* v. 2, Jan. 1951, p. 16-17.

Process in which a pasty mass of ground mica and highly acid phosphate solution is applied to sheet steel. The applied layer resists a potential of more than 120 volts, and will remove rust as well as protecting the metal from rusting. (L14, ST, SG-p)

298-L. Chemical Coloring (Patina Formation) on Metallic Artistic and Useful Articles. (In German.) H. Krause. *Metalloberfläche,* v. 3, ser. B, Jan. 1951, p. 1-3; Feb. 1951, p. 22-24.

The various types of patina which form naturally on Cu and its alloys in different atmospheres. Second installment: suggestions for testing of specific metals and alloys for ability or tendency to form a patina. (L14, Cu)

299-L. Plant Observations on a Potassium Cyanide Copper Bath. (In German.) W. Savelsberg. *Metalloberfläche,* v. 3, ser. B, Jan. 1951, p. 4-6.

Causes of formation of pores and bubbles in copper electrodeposits were investigated. Deposition potentials of different electrolytes were measured. (L17, Cu)

300-L. Electrolytic Removal of Galvanic Deposits. (In German.) A. Pollack. *Metalloberfläche,* v. 3, ser. B, Jan. 1951, p. 8-9.

Procedures for removal of Ni, Cu, Sn, Cr, and Ag electrodeposits. (L17, Ni, Cu, Sn, Cr, Ag)

301-L. Insufficient or Excess Deposition of Silver on Tableware. (In German.) Carl Schaarwächter. *Metalloberfläche,* v. 3, ser. B, Feb. 1951, p. 17-18.

Use of continuous control and inspection of the plating process to avoid insufficient or excess deposition. (L17, Ag)

302-L. Hot-Tinning of Cast Iron. (In German.) *Metalloberfläche,* v. 3, ser. B, Feb. 1951, p. 19-21.

Successful methods of tin plating. (L16, Sn, CI)

303-L. Use of Protective Atmosphere in Metal Spraying. (In German.) *Metalloberfläche,* v. 5, ser. A, Feb. 1951, p. 28-30.

An exchange of correspondence on "Problems in the Technique of Metal Spraying," by Püschel, (Sept. 1950 issue, item 793-L, 1950), between Dr. Püschel and Hans Biel. (L23)

304-L. Cleaning Ingots and Rolled Stock. (In German.) Heinrich Rübmann. *Stahl und Eisen,* v. 71, Mar. 15, 1951, p. 288-293; disc. p. 293-294.

Various methods and equipment for cleaning, which is done primarily to prevent defects upon rolling ferrous ingots. (L10, L12, F21, ST)

305-L. Textured Organic Coatings. Lester Back. *Product Engineering,* v. 22, Apr. 1951, p. 129-136.

New one and two-coat spray application "special effect" finishes for metals which are rapidly supplanting older types. Application characteristics, appearance, and film properties compare favorably with the usual protective enamels. Includes illustrations in color and a folded chart. (L26)

306-L. Flock Finishing. *Die Castings,* v. 9, Apr. 1951, p. 37-38, 40-42, 51, 61-63.

Processes, properties, and applications. (L26)

307-L. A Production Line Report: Several Finishes Applied by Versatile Plating Set-Up. *Die Castings,* v. 9, Apr. 1951, p. 44-45, 52.

Versatile production line of American Safety Razor Corp. which is capable of applying a variety of plated finishes to die-cast and stamped Zn or brass parts. (L17, Zn, Cu)

308-L. Metal Etching and Anodizing in Color. R. E. Pettit. *Products Finishing,* v. 15, Apr. 1951, p. 14-23, 26-28.

Equipment, procedure, and products of Chicago Thrift-Etching Corp. Metal etchings, identification plates, scales, rules, instrument dials and premium items, metal and plastic coin banks, and Al finishing by the Alumilite process (clear and in color) constitute products and activities. (L14, L19, Al)

309-L. Chlorinated Rubber Corrosion-Resistant Coatings. F. K. Shankweiler, G. N. Bruxelles, and R. E. Whitney. *Products Finishing,* v. 15, Apr. 1951, p. 28, 30, 34. (A condensation.)

Formulation of these coatings for protection of metal surfaces in various industries. (L26)

310-L. Chemical Surface Treatment Extends the Durability of Kool-Vent All-Weather Aluminum Awnings. Norman P. Gentieu. *Products Finishing,* v. 15, Apr. 1951, p. 38-43.

"Alodizing" process. (L14, Al)

311-L. Ironite Simplifies Paint Stripping Operation. Bert Doggett. *Products Finishing,* v. 15, Apr. 1951, p. 78, 80.

Use of proprietary material—Klem Stripper No. 74. (L12)

312-L. Metal Furniture Manufacturer Utilizes Power Brushing in Surface Preparation for Plating. *Products Finishing,* v. 15, Apr. 1951, p. 80, 82, 84. (L10)

313-L. Application of Organic Coatings to Metal. I. B. M. Letsky. *Paint Manufacture,* v. 21, Mar. 1951, p. 83-89, 109.

Several processes of dipping, tumbling, and spraying; some aspects of the Rotodip and Ransburg processes. Roller coating on metal, an important adjunct of the canning industry. (To be continued.) (L26)

314-L. Furan Resin Linings. R. McFarland. *Corrosion* (News Section), v. 7, Apr. 1951, p. 1-2.

Use as linings on cast iron and cast steel valve bodies. Table gives resistance to common commercial chemicals. (L26, CI)

315-L. Die Polishing Time Cut 10 Per Cent by Liquid Blasting. *Production Engineering & Management,* v. 27, Apr. 1951, p. 57.

Process developed by Pangborn Corp. and its application by Rockford Drop Forge Co. to reduce the time required to clean and finish forging dies. (L10, ST)

316-L. Removal of Stearic Acid From Surfaces by Alkaline Detergents. Fred Hazel and Wm. Stericker. *Industrial and Engineering Chemistry,* v. 43, Apr. 1951, p. 919-925.

Various alkaline chemicals used as cleaners were tested for their ability to remove "stearic acids" of different melting ranges from Zn, Al, steel, and—for comparison—glass surfaces. The results should be helpful in formulating polishing and buffing compounds and in setting up conditions for their removal from die castings. (L10, L12, Zn, Al, ST)

317-L. Protective Coatings Research by the Bureau of Ships. *Paint and Varnish Production,* v. 41, Apr. 1951, p. 13-16, 26.

Means for prevention of corrosion, deterioration, wear, and fouling. Methods include the application of electrochemical principles; coatings such as paints and organic preservatives in liquid form; metallic and ceramic coatings. (L general, T22, ST)

318-L. Cleaning and Finishing Stainless Steels. T. C. DuMond. *Materials & Methods,* v. 33, Apr. 1951, p. 93-104.

Manual, which covers the most common cleaning and finishing methods, indicates that stainless steels are not difficult to finish. Certain precautions. (L general, SS)

319-L. The Development, Production and Manufacture of Electro-Tinplate. W. E. Hoare. *Sheet Metal Industries,* v. 28, Apr. 1951, p. 309-321.

Commercial equipment and procedures. 34 ref. (L17, ST, Sn)

320-L. Surface Treatment and Finishing of Light Metals. Part 7. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 28, Apr. 1951, p. 373-379, 383.

Industrial anodizing of Al and its alloys and the chromic-acid processes. (To be continued.) (L19, L14, Al)

321-L. Electroplating Aluminium and Aluminium Alloy Components. Part I. Study of Pretreatments and Dipping Processes. E. E. Halls. *Metal Treatment and Drop Forging,* v. 18, Mar. 1951, p. 125-131.

(To be continued.) (L17, Al)

322-L. (Book) **Metal Finishing Guidebook—Directory. Ed. 19.** 488 pages. 1950. Finishing Publications, 11 W. 42 St., New York 18. $2.50.

Finishing plant engineering, mechanical and chemical surface preparation, plating solutions, operating data, special plating procedures and surface treatments, control, analysis, and testing. Lists suppliers, manufacturers, trade names, consultants, schools, societies, etc. (L general, A10)

323-L. (Pamphlet) **1950 Supplement to the Metal Cleaning Bibliographical Abstracts.** Jay C. Harris. *American Society for Testing Materials.* Special Technical Publication 90-A, 1950, 27 pages. $3.00.

Additional references for 1932-1948 and new references covering 1949-1950. (L10, L12)

324-L. (Pamphlet) **Twenty Years of Research for the Galvanizing Industry.** W. L. Hall and D. N. Fagg. 1950, 16 pages. Hot Dip Galvanizers Assn. Oxford, England.

Effect of temperature, immersion time, rate of withdrawal, additions to the bath, and base-metal composition on the reaction between the Zn and steel. Wrought and ingot iron and rimmed, balanced, and copper-bearing balanced basic open-hearth steel were investigated. dross formation and corrosion resistance of galvanized coatings. (L16, Fe, ST, Zn)

325-L. (Pamphlet) **Tinplate Handbook.** W. E. Hoare. 1950, 31 pages. *Tin Research Institute,* Greenford, Middlesex, England; or 492 W. 6th Ave., Columbus 1, Ohio. Gratis.

World production, manufacture, grades, qualities, packing, ordering, testing, and applications. (L16, L17, Sn)

M — METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

78-M. Electron Diffraction Studies of Etched Au Leaf Films. W. V. Stauder and A. H. Weber. *Journal of the Franklin Institute,* v. 251, Mar. 1951, p. 351-357.

Anomalies occurring in electron-diffraction patterns of these films were of two kinds, extra lines and orientation effects. The extra lines were attributed to contamination by some long-chain compound. The orientation effects consisted of variation of intensities of several of the lines from those of the same lines observed in standard patterns of randomly oriented Au. Results confirm the findings of other investigators, particularly those of Trillat and Hirsch. (M21, Au)

79-M. Differentiation of Grain Size and Phases in Titanium. Constance B. Craver. *Metal Progress,* v. 59, Mar. 1951, p. 371-373.

Use of polarized light. (M27, Ti)

80-M. Etching Steels Which Contain the Sigma Phase. John J. Gilman. *Metal Progress,* v. 59, Mar. 1951, p. 376B, 377.

Methods found most useful for high Cr-Ni stainless steels. (M21, SS)

81-M. Constitution of Iron-Chromium-Molybdenum Alloys at 1200° F. Spencer R. Baen and Pol Duwez. *Journal of Metals,* v. 3, Apr. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, p. 331-335.

Phase boundaries of the system were determined at 1200° F. by meas-

uring lattice parameters of the various phases and drawing the parameter contours and the tie lines in the one-phase and two-phase regions, respectively. 13 ref.
(M24, Fe, Cr, Mo)

82-M. Radioisotopes Aid Studies of High-Temperature Materials. W. E. Jones. *Steel,* v. 128, Mar. 26, 1951, p. 78.
Techniques and applications to microstructure studies. (M23, SG-h)

83-M. Long-Range Order in Beta-Brass and Cu_3Au. D. T. Keating and B. E. Warren. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 286-290.
Measurements were made on single crystals of CuZn and Cu_3Au held at various temperatures below T_c to decide whether there is a single-ordered phase whose order changes with temperature, or whether there is an ordered and a disordered phase the relative amounts of which change with temperature. Precision measurements were made of position and width of the (222) CuZn and (400) Cu_3Au reflection. Measurements of the long-range order in Cu_3Au were made. 10 ref.
(M26, N10, Cu, Au)

84-M. The Crystal Structure of the Sigma-Phase in the Co-Cr System. J. S. Kasper, B. F. Decker, and J. R. Belanger. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 361-362.
Data obtained on a single-crystal specimen. Compares results with those of other investigators.
(M26, Co, Cr)

85-M. The Apparent Ferrite-Cementite Ratio in Micrographs of Pearlite Structure. G. L. J. Bailey. *Research,* v. 4, Mar. 1951, p. 139-140.
In a recent discussion, Hume-Rothery commented on the difference in relative proportions of ferrite and cementite shown in electron micrographs of eutectoid steels presented by different authors. Suggests an explanation which predicts that the effect should be more commonly observed with fine pearlitic structures which can be examined in the electron microscope than with coarser structures examined in the light microscope. (M27, ST)

86-M. Gamma Ray Metallography. (Concluded.) Jean Ternisien. *Microtecnic* (English Ed.), v. 4, Nov.-Dec. 1950, p. 321-325. (Translated from the French).
11 references. (M23)

87-M. Borides and Silicides of the Platinum Metals. *Nature,* v. 167, Mar. 3, 1951, p. 362.
Each of the 12 binary systems comprising B or Si with Ru, Rh, Pb, Os, Ir or Pt was studied over the full range of composition. Phases listed in the accompanying table have been characterized.
(M24, EG-c, B, Si)

88-M. Sigma-Phase in Transitional Metal Alloys. *Nature,* v. 167, Mar. 3, 1951, p. 365-366.
Existence of a phase isomorphous with the sigma-phase of the Fe-Cr system has now been proved in a number of other alloys containing transitional elements. A theory of atomic structure in which appearance of sigma-phase is predicted when electron-atom ratio falls within certain limits. 13 ref. (M27)

89-M. Intrinsic Crystalline Structure and the Strength of Metals. W. A. Wood. *Philosophical Magazine,* ser. 7, v. 42, Mar. 1951, p. 310-312.
Fundamental theories with reference to recent work of Fürth, Born, and Paterson. (M26, Q23)

90-M. Calculated and Experimental Constitutional Diagrams of Simple Binary Systems. (In Russian.) Ya. E. Geguzin and B. Ya. Pines. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser. v. 75, Nov. 21, 1950, p. 387-390.
Attempts to verify experimentally the validity of constitutional diagrams, plotted on the basis of theoretical considerations and appropriate formulas formerly proposed by one of the authors for the simple type of binary systems. Data are tabulated and charted for Cu-Ni, Ag-Pd, Ag-Au, Cu-Pd, Au-Pd and several other binary metallic systems. (M24)

91-M. The Nickel-Tin Bronze Theory. James S. Vanick. *Foundry,* v. 79, Apr. 1951, p. 130-133, 278-279.
Supplements report presented in the Feb. issue with a discussion of the theory of the constitution and heat treatment of the Ni-Sn bronzes. Graphs and tables show effects of heat treatment and composition on mechanical properties. Photomicrographs show typical as-cast structures. (M24, Cu)

92-M. The Widened Lattice Interval and Its Essential Role in the Behavior of Crystalline Metal. Donald P. Smith. *Science,* v. 113, Mar. 30, 1951, p. 348-352.
Fundamental theories. Concludes that the widened lattice intervals are rifts in the crystal lattice, produced initially by plastic deformation but capable of extension or healing as conditions are varied. The rifts are apparently the distinctive characteristic of strained metal, responsible for at least some of its special properties—mechanical, magnetic, electrochemical, and presumably chemical. Existence and nature of the rifted state are demonstrated chiefly by the behavior of the metals with hydrogen. 47 ref. (M26)

93-M. The Experimental Study of Crystal Boundaries. Bruce Chalmers. *Canadian Mining and Metallurgical Bulletin,* v. 44, Mar. 1951, p. 207-209; disc. p. 209; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 137-139; disc. p. 139.
Elementary explanation of the technique and applications of the work being undertaken by the Physical Metallurgy Group, Dept. of Metallurgical Engineering, University of Toronto. (M26)

94-M. Critical Discussion of the Osann Diagram on the Basis of the Latest Research Results. (In German.) H. U. Doliwa. *Giesserei,* v. 38 (new ser., v. 4), Feb. 22, 1951, p. 79-80.
Refers to the C-Si diagram developed by Osann. Recent results show that three, not two, parts Si are equal to one part C in ferrous melts, while one part P counteracts one part Si. (M24, Fe, ST)

95-M. Research on Tempered Martensite. (In German.) Helmut Krainer. *Archiv für das Eisenhüttenwesen,* v. 22, Jan.-Feb. 1951, p. 53-61; disc. p. 62.
Hardened, tempered samples of unalloyed steel (1.07% C) were subjected to X-ray studies and coercive-force measurements in order to determine the lattice structure of martensite. Tempered at 100-200° C., martensite still has a distinct tetragonal structure, and its high hardness may be explained by the precipitated carbide phase. Coercive-force measurements were used to estimate average size of the precipitated cementite particles. Residual austenite was found to have a higher-than-average carbon content. 23 ref. (M27, ST)

96-M. An Automatic Apparatus for the Recording of Heat Content Curves and for Thermal Analysis at a Low Heating Rate. (In German.) Werner Jellinghaus. *Archiv für das Eisenhüttenwesen,* v. 22, Jan.-Feb. 1951, p. 65-71.
A modification of Sykes's apparatus which automatically controls heating rate of the specimen and records the heat-capacity curve. Several enthalpy curves of hardened and unhardened, unalloyed and slightly alloyed steels, which clearly indicate the decomposition of residual austenite in excess of 5%. 11 ref. (M23, P12, ST)

97-M. Vacuum Furnace for Metal Single Crystals. D. Lazarus and D. R. Chipman. *Review of Scientific Instruments,* v. 22, Mar. 1951, p. 211-212.
Modification which employs no moving parts within the high-vacuum system. (M23, N12)

98-M. A Simple Electrolytic Polishing Cell. M. N. Parthasarathi, B. S. Srikantiah, and B. R. Nijhawan. *Journal of Scientific and Industrial Research,* v. 10B, Feb. 1951, p. 46-48.
Laboratory apparatus and technique. Photomicrographs illustrate typical surface structure obtained. (M21)

99-M. Preparing Rod Specimens for X-Ray Photography. D. Summers-Smith. *Metallurgia,* v. 43, Mar. 1951, p. 154.
Technique. (M21)

100-M. Metallography of Carbon in Silicon-Iron Alloys Containing 4% Silicon. E. D. Harry. *Journal of the Iron and Steel Institute,* v. 167, Mar. 1951, p. 241-246.
Mode of occurrence of carbon in Si iron transformer sheets. Starts with the sheet bar, which may contain 0.050-0.10% C, and ends with the finished sheet, in which C content may vary from below the limit of solid solubility to 0.030%. Constitution of the carbide phase in these Si irons shows that this phase is duplex in structure, consisting of the ordinary iron-carbide, Fe_3C, and what is believed to be an Fe-Si-C compound, the two carbides appearing to form a eutectoid. 13 ref.
(M26, N8, Fe)

101-M. The Problems of the Determination of Atomic Structures by Means of the Electron Microscope. (In German.) L. Wegmann. *Helvetica Physica Acta,* v. 24, Feb. 15, 1951, p. 63-71.
Shows theoretically that resolving power of uncorrected electron lenses can be improved by limiting the field of concentric lens zones and that with this arrangement and by use of diffracted rays, it should be possible to determine the atomic structure of crystals. Includes diagrams and electron micrographs. 15 ref. (M25, M21)

102-M. (Book) **International Conference on the Physics of Metals.** 271 pages. 1949. Martinus Nijhoff, The Hague, Netherlands. (Reprinted from *Physica,* v. 15, p. 1-271).
The papers, which deal with structure, transformation, and physical and mechanical properties, were previously abstracted from originals. (M general, N general, P general, Q general)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

82-N. Studies of the Fischer-Tropsch Synthesis. IX. Phase Changes of Iron Catalysts in the Synthesis. Robert B. Anderson, L. J. E. Hofer, Ernst M. Cohn, and Bernard Seligman. *Journal of the American Chemical Society,* v. 73, Mar. 1951, p. 944-946.
Studied using a 50-50 H_2-CO mixture at 7.8 atm. In the first few days of the synthesis, α-iron was converted to Hägg carbide (Fe_2C). The iron as Hägg carbide increased to a maximum of 29% at 200 hr. of synthesis, and then decreased slowly throughout the remainder of the test. Magnetite was formed at a slower rate

than Hägg carbide, apparently chiefly at the expense of the α-iron phase. The magnetite phase increased throughout the experiment. 12 ref. (N8, Fe)

83-N. Titanium-Boron Alloys. H. R. Ogden and R. I. Jaffee. *Journal of Mteals,* v. 3, Apr. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, p. 335-336.

Recent work by Ehrlich and by Craighead, Simmons, and Eastwood is in conflict with regard to the solubility of B in Ti. Some new work indicates that the solubility of B in both α and β Ti is probably well below 0.4% B, and that B has no observable effect on the transition temperature of Ti. The hexagonal close-packed structure of the second phase indicated that it is probably of the M_2X type, or Ti_2B. (N9, M26, Ti, B)

84-N. Phase Equilibria in an Ordering Alloy System. J. B. Newkirk, R. Smoluchowski, A. H. Geisler, and D. L. Martin. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 290-298.

Equilibria between phases in Pt alloys containing 42, 48, and 54% Co were determined below 1000° C. This system of alloys exhibits an order-disorder transition analogous to that for CuAu. A temperature range in which ordered and disordered phases coexist in equilibrium was determined for each alloy. These data were incorporated in the phase diagram. 16 ref. (N10, M24, Pt, Co)

85-N. A Metallographic Study of Diffusion Interfaces. G. C. Kuczynski and B. H. Alexander. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 344-349.

By sintering wires to flat metallic blocks, diffusion interfaces were obtained between Cu-Ni, Au-Ag, Cu-Ag, Cu-Fe, Fe-Ni, Cu-Zn, Ni-Zn, and 70-30 brass-Cu. The interfaces were investigated metallographically. Grooves were observed in the lower-melting-point component in the vicinity of the sintered interfaces. This is attributed to the faster diffusion rate in the lower-melting-point metal. (N1, Cu, Ni, Au, Ag, Fe, Zn)

86-N. The Effects of Alloying Elements in Steel. III. (Concluded). Joseph K. Stone, Jr. *Industrial Heating,* v. 18, Mar. 1951, p. 434, 436, 438.

The solution strengthening of ferrite and the stabilization of carbides. (N8, ST)

87-N. The Cohesion of Alloys. I. Intermetallic Systems Formed by Copper, Silver, and Gold, and Deviations From Vegard's Law. II. Some General Metallurgical Implications. W. G. Henry, M. A. Jaswon, and G. V. Raynor. **III. Extension to High Solute Concentrations, and Application to the Alloys of Group IA Metals.** W. G. Henry and G. V. Raynor. *Proceedings of the Physical Society,* v. 64, sec. B, Mar. 1, 1951, p. 177-206.

A new treatment designed to extend the theory of the cohesion of metals to alloy structures. Excess energy of the solid solution, as compared with that of a mixture of the pure components, is estimated by assuming that introduction of a solute atom causes a major disturbance extending only to its nearest neighbors, and a less serious disturbance in the surrounding matrix. Deviations from Vegard's law to be expected in the solid solutions formed by Cu, Ag, and Au taken in pairs are evaluated. Application of the theory to problems of solid-solution formation. Part II: certain phenomena of general theoretical interest. Part III: the theory is applied to estimation of extra energy associated with the solution of one metal in another to form an alloy. Calculations made for the binary alloys of the alkali metals give good results. Solid-solution formation is restricted in all the possible systems except K-Rb, K-Cs, Rb-Cs, Na-K, Na-Rb, and Na-Cs. The eutectic compositions in the systems Na-K, Na-Rb, and Na-Cs; the formation of immiscible liquid systems. 22 ref. (N12, Cu, Ag, Au, EG-e)

88-N. Growth of Single Crystals of Tin From the Melt. A. J. Goss and S. Weintroub. *Nature,* v. 167, Mar. 3, 1951, p. 349-350.

Experimental work. (N12, Sn)

89-N. The Shaping of Metal Crystals. P. R. Rowland. *Transactions of the Faraday Society,* v. 47, Feb. 1951, p. 193-194.

A method for growing metal single crystals from the melt in shapes such as spheres, flat strips, mechanical test pieces, etc., suitable for chemical and physical examination. A simple technique for preparing a flat surface parallel to a given crystal plane. (N12, M23)

90-N. Theory of Order-Disorder Transformation in Binary Alloys. (In French.) Gérard Fournet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 8, 1951, p. 155-157.

The general theory of Yvon and indicates its possible application to the above modifications. Agreement with experimental data of Chipman and Warren and of Cowley is shown. (N10)

91-N. Existence of a Nucleation Process in Controlled Oxidation of Iron at High Temperatures. (In French.) Jean Bardolle and Jacques Bénard. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 15, 1951, p. 231-232.

Studies using pure electrolytic or Armco iron at 850° C. under vacuum, using nitrogen plus traces of oxygen, oxides, or incompletely deoxidized metals as deoxidizing agents. Results prove existence of a relationship between orientation of the oxide lattice and that of the base metal. (N2, R2, Fe)

92-N. A Theory of Cooperative Phenomena. Ryoichi Kikuchi. *Physical Review,* ser. 2, v. 81, Mar. 15, 1951, p. 988-1003.

A new method of approximation for order-disorder phenomena is explained for the one-dimensional Ising lattice. Approximations already known, such as those of Bethe and of Kramers-Wannier, are shown to be derived as special cases of the method with suitable choices of variables. An improved treatment for the 3-dimensional simple cubic Ising lattice is found to agree with the rigorous expansion of the partition function up to the 4th moment by Kirkwood's moment method, so far as the disordered state is concerned. The general formula for entropy. An improved treatment of the face-centered lattice (Ising model). 19 ref. (N10)

93-N. Thermodynamics and Structure of the Iron-Carbon Alloys. (In German.) Erich Scheil. *Archiv für das Eisenhüttenwesen,* v. 22, Jan.-Feb. 1951, p. 37-52.

Attempts to develop a new concept of Fe-C melts and solid solutions. Calculations lead to the conclusion that C is primarily in gaps between the Fe atoms, and that when one gap is occupied, occupation of the neighboring gaps is improbable because of increase in electron concentration. Wagner and Schottky's disorientation formulas are modified to facilitate the calculations. 62 ref. (N12, P12, ST)

94-N. Gases in Pig Iron and Their Influence on the Quality of Raw Materials. (In Czech.) Vladimir Zednik. *Hutnické Listy,* v. 5, Nov. 1950, p. 445-449; Dec. 1950, p. 485-492; disc. p. 492-495.

An anomalous relationship of oxygen solubility in iron to temperature and thermodynamic oxidation equilibrium. Summarizes existing theories of influence of gases on the quality of pig and cast irons. Results of experiments show wide variation in gas content, even for consecutive samples from one heat. H_2 content usually rises parallel to O_2 content. Laboratory and plant tests show that remelting has a favorable effect on dissolved gas content. Photomicrographs show effect of gas content on graphitization and microstructure. 14 ref. (N12, CI)

95-N. Self-Diffusion in Cobalt. Foster C. Nix and Frank E. Jaumot, Jr. *Physical Review,* ser. 2, v. 82, Apr. 1, 1951, p. 72-74.

Measured by using radioactive Co^{60} which was evaporated onto the surface of pure Co samples. Data at 1050, 1150, and 1250° C. are used to develop an empirical formula for the self-diffusion coefficient. (N1, Co)

96-N. Eutectic Solidification in Metals. W. C. Winegard, S. Majka, B. M. Thall, and B. Chalmers. *Canadian Journal of Chemistry,* v. 29, Apr. 1951, p. 320-327.

A study was made of the solidification of Sn-Pb alloys, whose eutectic structures are typically lamellar. A technique was developed in which rate and direction of solidification are controlled. It is shown that freezing takes place by simultaneous edgewise growth of the lamellae, the thickness of which depends on rate of freezing. The solid-liquid interface at any instant is corrugated, owing to the fact that one of the phases is in advance of the other. A detailed description of the process of eutectic solidification. 10 ref. (N12, Sn, Pb)

97-N. Mechanism of Precipitation in Aluminium-Magnesium Alloys. E. C. W. Perryman and G. B. Brook. *Journal of the Institute of Metals,* v. 79, Mar. 1951, p. 19-34.

The precipitation mechanism in commercial-purity Al with 7% Mg and high-purity Al with 10% Mg was investigated by metallographic methods, and by hardness and X-ray measurements. Effect of 0.5 and 1% Zn on rate of precipitation and hardening of the former alloy was also studied. Includes photomicrographs, diffraction patterns, tables, and graphs. 21 ref. (N7, Al)

98-N. Regular Distribution of Precipitates in a Copper-Beryllium Alloy After Long-Time Aging. (In Russian.) B. M. Rovinskii and N. D. Gambashidze. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 76, Jan. 21, 1951, p. 399-401.

Precipitation of new phases from a saturated solid solution of about 2% Be in Cu aging for about 15 years and their distribution in the crystal lattice. Method of investigation. (N7, Cu)

99-N. (Book) **Crystal Growth.** H. E. Buckley. 571 pages. 1951. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $9.00.

Solution and solubility, artificial preparation of crystals, theories of crystal growth, velocities of growth, diffusion theories, ideal and real crystals, types of crystallization, dissolution phenomena, crystal-habit modification by impurities, relationships of substances during crystallization, and peculiarities of crystal growth. Much of the theory is applicable to both metals and nonmetals. Most of the illustrations given are nonmetallic, however, sections are included on metallic crystals. Extensive chapter bibliographies. (N12, N2, M26)

P

PHYSICAL PROPERTIES AND TEST METHODS

105-P. Fluid Flow Through Porous Metals. Leon Green, Jr., and Pol Duwez. *Journal of Applied Mechanics,* v. 18 (*Transactions of the American Society of Mechanical Engineers,* v. 73), Mar. 1951, p. 39-45.

Method for correlating experimental data obtained in studies of the above. The correlation is based upon the suggestion of Forcheimer that the pressure gradient attending flow of a liquid through a porous medium can be expressed as a function of flow rate by a simple quadratic equation. Results of experiments on variety of porous metals. 11 ref. (P10)

106-P. Low Temperature Heat Capacities of Inorganic Solids. V. The Heat Capacity of Pure Elementary Boron in Both Amorphous and Crystalline Conditions Between 13 and 305° K. Some Free Energies of Formation. Herrick L. Johnston, Herbert N. Hersh, and Eugene C. Kerr. *Journal of the American Chemical Society,* v. 73, Mar. 1951, p. 1112-1117.

28 references. (P12, B)

107-P. Viscosity of the Sodium-Potassium System. Curtis T. Ewing, Joseph A. Grand, and R. R. Miller. *Journal of the American Chemical Society,* v. 73, Mar. 1951, p. 1168-1171.

A closed viscometer technique was developed and applied to reactive metals with unusually high surface-tension ranges. Viscosities were measured for Na, K, and several alloys from 60 to 200° C. The values for the alloys were observed to vary uniformly between those for the metals, and an equation was applied to satisfy the data. (P10, Na, K)

108-P. Specific Heat of Beryllium Between 0° and 900°. D. C. Ginnings, T. B. Douglas, and Anne F. Ball. *Journal of the American Chemical Society,* v. 73, Mar. 1951, p. 1236-1240.

Using an ice calorimeter and furnace of improved design, the specific heat of two samples of Be was determined by measuring changes of enthalpy between above limits. Sources of error in the values obtained are examined. 15 ref. (P12, Be)

109-P Phase Boundary Potentials of Nickel in Foreign Ion Solutions. D. MacGillavry, J. J. Singer, Jr., and J. H. Rosenbaum. *Journal of the American Chemical Society,* v. 73, Mar. 1951, p. 1388.

Investigation of phase-boundary potentials of inert metals in contact with solutions initially free from the common metal ions was believed to be of value in understanding the initial processes which induce corrosion of metal. A preliminary account of measurements on Ni. (P13, R1, Ni)

110-P. H. F. Magnetization of Ferromagnetic Laminae; Application of Classical Theory. O. I. Butler and H. R. Chablani. *Wireless Engineer,* v. 28, Mar. 1951, p. 92-97.

An attempt to improve the accuracy and consistency of calculations based on the classical theory of a.c. magnetization of ferromagnetic laminae by use of a value of permeability which differs from the ratio of peak values of B and H. Calculated results for power loss and apparent permeability of Si steel samples give fairly close agreement with experiment. 13 ref. (P16, AY, SG-n)

111-P. The Effects of Radiation on Materials. J. C. Slater. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 237-256.

Types of damage produced by various kinds of radiation in various solids, with relation to the theory of solid-state structure. Types of experiments which have been or could be performed to investigate radiation damage. Atomic and band pictures of solids; mechanical properties of solids; electrical and thermal conductivity; nature of radiation damage; and radiation damage to different types of materials (metals, semiconductors, ionic compounds and ceramics, and molecular solids.) (P10, M25, Q general)

112-P. The Mobility and Life of Injected Holes and Electrons in Germanium. J. R. Haynes and W. Shockley. *Physical Review,* ser. 2, v. 81, Mar. 1, 1951, p. 835-843.

Mobilities of holes injected into *n*-type Ge and of electrons injected into *p*-type Ge were determined by measuring transit time between emitter and collector in single-crystal rods. Strong electric fields in addition to those due to injected current employed so that spreading effects due to diffusion were reduced. 25 ref. (P15, Ge)

113-P. Significance of Composition of Contact Point in Rectifying Junctions on Germanium. W. G. Pfann. *Physical Review,* ser. 2, v. 81, Mar. 1, 1951, p. 882.

Experiments with *n*- and *p*-Ge transistors indicate that composition of the contact point *can* influence the properties of rectifying junctions. The significant feature of the metal point is its content of donors and acceptors. By means of an electrical treatment known as forming, it appears that donor or acceptors from the point can be introduced to or into the Ge, thereby affecting the space-charge region and the electrical properties of the junction. Two illustrations of the role of point composition in determining the properties of metal-Ge junctions are given. (P15, Ge)

114-P. Magnetic Domain Patterns on Nickel Crystals. Mikio Yamamoto and Takao Iwata. *Physical Review,* ser. 2, v. 81, Mar. 1, 1951, p. 887-888.

Magnetic powder patterns on single crystals of pure Ni whose ferromagnetic anisotropy constant is less than zero. Their interpretation. (P16, SG-n,p)

115-P. Periodic Deviations in the Schottky Effect for Polished Tantalum. G. B. Finn, W. B. LaBerge, and E. A. Coomes. *Physical Review,* ser. 2, v. 81, Mar. 1, 1951, p. 889.

Irregularities on an emitter surface may limit the accuracy with which certain observed emission phenomena can be checked against fundamental theory. To examine this limitation, Schottky data were taken on polished Ta wire and the deviations compared with data previously obtained for unpolished wire. (P15, Ta)

116-P. Anisotropy of Electrical Resistivity of Cold-Rolled Cubic Metals and Alloys. T. Broom. *Philosophical Magazine,* ser. 7, v. 42, Jan. 1951, p. 56-62.

The electrical resistivity of cold rolled Cu, low-carbon steel, brass, and sterling silver was found to vary with direction of measurement. Magnitude of the anisotropy may be qualitatively accounted for by considering the effect of oriented dislocations. Temperature coefficients of resistivity of these rolled metals are isotropic to within 0.5%. (P15, Cu, CN, Ag)

117-P. The Electrical Resistance of Gold, Silver, and Copper at Low Temperatures. E. Mendoza and J. G. Thomas. *Philosophical Magazine,* ser. 7, v. 42, Mar. 1951, p. 291-303.

A brief review of published papers on electrical resistance at very low temperatures shows that several metals exhibit a feature which has not yet been explained theoretically, namely that the resistance goes through a minimum value as the temperature decreases. By means of an apparatus for measuring electrical resistance below 1° K. the effect was confirmed in Au and Ag and also found in Cu. 31 ref. (P15, Au, Ag, Cu)

118-P. The Thermodynamic Properties of Binary Liquid Cadmium Solutions. John F. Elliott and John Chipman. *Transactions of the Faraday Society,* v. 47, Feb. 1951, p. 138-148.

An electrode-potential study was made in the range 400-600° C. with Cd as the more electropositive component in the binary solutions Cd-Pb, Cd-Bi, Cd-Sb, and Cd-Sn. Activities and thermodynamic properties are reported for the four binary solutions at 500° C. 13 ref. (P12, Cd)

119-P. The Thermal Conductivity of a Copper-Nickel Alloy at Low Temperatures. J. K. Hulm. *Proceedings of the Physical Society,* v. 64, sec. B, Mar. 1, 1951, p. 207-211.

Thermal and electrical conductivities of an alloy of 80% Cu and 20% Ni with average crystal grain size 0.011 mm. were measured at liquid H_2 and He temperatures. Compares results with Makinson's theory. 12 ref. (P11, Cu, Ni)

120-P. Infra-Red Photoconductivity of Certain Valence Intermetallic Compounds. J. G. N. Braithwaite. *Proceedings of the Physical Society,* v. 64, sec. B, Mar. 1, 1951, p. 274-275.

The high sensitivity, but limited spectral range, of photoconductive materials such as Tl_2S, PbS, and PbTe led to a search for similar materials, sensitive to radiation of longer wavelength. Data are tabulated for Cu_2Te, Ag_2Te, ZnTe, HgTe, Tl_2Te, Sb_2Te, Mo_2Te, W_2Te, U_2Te, Zn_3As_2, SnS, and Sb_2Se_3. (P17, Te, EG-a)

121-P. Electrical Resistance of Surface Contacts on Aluminium. *Light Metals,* v. 14, Mar. 1951, p. 165-168.

Results of recent research on Al-sheathed cables and associated fittings. (P15, T1, Al)

122-P. Measurements on the Electrical Resistivity of Thin Iron Films at Liquid Helium Temperatures. (In English.) R. Lambeir, A. Van Itterbeek, and G. J. Van Den Berg. *Physica,* v. 16, Dec. 1950, p. 907-914.

At the lowest temperatures, a very steep decrease of resistance as a function of current was found to exist. This decrease is very sensitive to temperature and is connected to the temperature coefficient of the film, which depends on the kind of gas (Ne or H_2) used during sputtering. The phenomenon seems to be connected to the fact that thin films are composed of small crystals separated by very narrow channels. (P15)

123-P. Capacity and Dielectric Losses of an Oxide Layer Deposited by Anodic Oxidation on Aluminum. (In French.) W. Ch. van Geel and J. W. A. Scholte. *Philips Research Reports,* v. 6, Feb. 1951, p. 54-74.

A model of the structure of the oxide layer on Al is given, based on measurements of capacity and dielectric losses of this layer. It was found that dielectric losses decrease with increasing thickness of the oxide layer. Capacity as a function of forming voltage was measured by means of an a.c. bridge and also by a ballistic method. As a result of the measurements, a mechanism of the formation of the layer and for its dielectric behavior is postulated. (P15, L19, Al)

124-P. Electrical Properties of Gray Tin. (In Russian.) A. I. Blum and N. A. Goryunova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 75, Nov. 21, 1950, p. 367-370.

Electroconductivity, thermal e.m.f., and Hall effect of specially prepared compacted gray Sn powder. Methods of compacting and preparation of test specimens. (P15, H14, Sn)

125-P. Some Properties and Tests of Magnetic Powders and Powder Cores. C. E. Richards, S. E. Buckley, P. R. Bardell, and A. C. Lynch. *Electrical Communication,* v. 28, Mar. 1951, p. 55-69.

Previously abstracted from *Proceedings of the Institution of Electrical Engineers.* See item 208-P, 1950. (P16, H10, Fe, Ni)

126-P. Measurement of Pressure by Means of Metallic Test-Pieces. E. Fischer. *Engineers' Digest,* v. 12, Mar. 1951, p. 94-96. (Translated and condensed.)

Previously abstracted from *Zeitschrift des Vereines Deutscher Ingenieure.* See item 51-P, 1951. (P11, Pb, Cu, Al, Ni)

127-P. Reflection and Transmission at the Surface of Metal-Plate Media. Bela A. Lengyel. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 265-276.

The theory of Carlson and Heins was extended; an expression was found for reflection coefficient applicable in the presence of a diffracted beam. Tables and graphs are included for coefficients associated with electromagnetic phenomena at the surface of metal-plate media. Satisfactory agreement with theory is obtained. (P17)

128-P. Experimental Determination of the Reflection Coefficient of Metal-Plate Media. J. Ruze and M. Young. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 277-278.

A method of measuring the above at 3 cm. The technique differs from that presented in the preceding paper in that measurements are made in a closed system and back reflections are eliminated by an absorbing wedge. Angle of incidence and plate thickness are varied. Agreement with the Carlson-Heins theory is excellent for very thin plates. (P17)

129-P. Emittances of Oxidized Metals. John P. Dobbins. *American Society of Mechanical Engineers,* Paper 50-A-58, 1950, 33 pages.

Fundamental relationships are derived for computing thermal emittances of idealized composite surfaces from other known physical properties of the component materials. Practical engineering estimates of the emittances of bare and oxidized Al, Ti, and Zn may be made from known values of electrical resistivities of the metals and refractive indices of their oxides. Theoretical predictions are consistent with actual emittance measurements. 30 ref. (P11, Al, Ti, Zn)

130-P. Calculations of Surface Energy for a Free-Electron Metal. H. B. Huntington. *Physical Review,* ser. 2, v. 81, Mar. 15, 1951, p. 1035-1039.

A square-cut barrier place was used so that there was no net charge on the surface. The result is nearly independent of barrier height but leads of a value for surface tension less than half that observed for most molten metals. For sodium a self-consistent surface barrier, first developed by Bardeen, was also used in numerical computation of surface energy. The value so obtained was about half that resulting from use of the square-cut barrier. 12 ref. (P10)

131-P. Adsorption on Evaporated Tungsten Films. I. Oxygen and Carbon Monoxide Chemisorption and the Determination of Film Surface Areas. E. K. Rideal and B. M. W. Trapnell. *Proceedings of the Royal Society,* ser. A, v. 205, Feb. 22, 1951, p. 409-421.

Studied between 20 and −195° C. and at pressures up to 10^{-2} mm., with the primary aim of measuring the surface areas of the films. The two methods gave results which agree. The film areas were determined to an accuracy of about 5%. Values for the fraction of the surface atoms covered at various temperatures and pressures were obtained, together with isothermal heats at various coverages. 15 ref. (P13, W)

132-P. The Determination of the Equilibrium Constant of the Reaction Between Molten Iron and Hydrogen Sulphide. J. White and H. Skelly. *Journal of the Royal Technical College,* v. 5, Jan. 1950, p. 226-230.

Summary of a paper which appeared in *Journal of the Iron and Steel Institute.* See item 2-65, 1947. (P12, Fe)

133-P. Electron Emission Measurements in the Tungsten-Carbon and Molybdenum-Carbon Systems. (In German.) *Zeitschrift für angewandte Mathematik und Physik,* v. 2, Jan. 15, 1951, p. 49-51.

Experiments with W and Mo wires carbonized in a high vacuum with naphthalene vapor. (P15, W, Mo, C-n).

134-P. Resistance Alloys. (In German.) Hans Thomas. *Zeitschrift für Physik,* v. 129, Feb. 13, 1951, p. 219-232.

Experimental study of Ni-Cr, Fe-Al, Ni-Al, Fe-Si, Ni-Cu-Zn, Ni-Cu, and a few other alloys made to determine effect of concentration, annealing temperature and time, degree of deformation, and aging on specific resistance of the various alloys. 30 ref. (P15, SG-q)

135-P. Adsorption of Polar Organic Compounds on Steel. E. L. Cook and Norman Hackerman. *Journal of Physical & Colloid Chemistry,* v. 55, Apr. 1951, p. 549-557.

Adsorption from solution of higher-molecular-weight aliphatic acids, amines, alcohols, and certain esters on SAE 1020 steel powder with a specific surface area of 0.10 sq. m. per g. was studied. Two types of adsorption, irreversible and reversible, were observed for these systems. Extent of total adsorption was a function of a molecular weight and polar group. It was found to exceed the calculated amount necessary for a complete close-packed monolayer by 20-70%, depending on the compound. Points out importance of the results in corrosion prevention and lubrication. 11 ref. (P13, R1, ST)

136-P. A Radiographic Method of Dilatometry. A. H. Smith, N. A. Riley, and A. W. Lawson. *Review of Scientific Instruments,* v. 22, Mar. 1951, p. 138-140.

Method applied to measurements of compressibility. Metal samples are subjected to pressures up to 10,000 atm. Observations of the length of the sample are made by causing X-rays to cast a shadow on a photographic plate. Changes in length of the shadow are then determined with a comparator. This technique, which has been used to measure the compressibilities of Al, Fe, and Cu, is easily adaptable to remote measurements of any type involving changes of length. (P10, M23)

137-P. An Automatic Magnetic Balance for the Study of Ferromagnetic Materials. R. F. S. Robertson and P. W. Selwood. *Review of Scientific Instruments,* v. 22, Mar. 1951, p. 146-152.

An instrument for plotting, automatically, magnetization-temperature curves for ferromagnetic substances. Data on performance of the instrument and sample plots of thermomagnetic runs for Ni, Fe_3O_4, and Fe_2C. 11 ref. (P16, Ni, SG-p)

138-P. Determination of Small Thermal Expansion Coefficients by a Micrometric Dilatometer Method. B. S. Lement, C. S. Roberts, and B. L. Averbach. *Review of Scientific Instruments,* v. 22, Mar. 1951, p. 194-196.

Method and apparatus for measurement near room temperature are described. Application to Invar. (P11, M23, Fe, SG-s)

139-P. Some Theorems on the Free Energies of Crystal Surfaces. Conyers Herring. *Physical Review,* ser. 2, v. 82, Apr. 1, 1951, p. 87-93.

Some theorems on relative free energies which follow from the Wulff construction for the equilibrium shape of a small particle, and some relations between atomic models of crystal surfaces and the surface-free-energy function used in this construction. Equilibrium shapes of crystals and of noncrystalline anisotropic media are classified. The condition is formulated for thermodynamic stability of a flat crystal face with respect to formation of a hill-and valley-structure. 25 ref. (P12)

140-P. Ferromagnetic Domains in Bicrystals of Nickel. Ursula M. Martius, Kenelm V. Gow, and Bruce Chalmers. *Physical Review,* ser. 2, v. 82, Apr. 1, 1951, p. 106-107.

The method of growing bicrystals of predetermined orientation developed by Chalmers was used to produce bicrystals of Mond nickel (99.92% Ni). Influence of grain boundaries on ferromagnetic domain patterns was studied. (P16, SG-p)

141-P. Observation of Magnetic Domains by the Kerr Effect. H. J. Williams, F. G. Foster, and E. A. Wood. *Physical Review,* ser. 2, v. 82, Apr. 1, 1951, p. 119-120.

Magnetic domains were observed by means of the Kerr magneto-optic effect on surfaces perpendicular and inclined to the *c* axis of hexagonal cobalt. (P16, Co, SG-n)

142-P. On the Hall Effect in Ferromagnetics. N. Rostoker and Emerson M. Pugh. *Physical Review,* ser. 2, v. 82, Apr. 1, 1951, p. 125-126.

Analysis on the basis of experimental data of A. W. Smith (1910) and some recent results reported by the authors, for Ni. (P16, P15, Ni, SG-p)

143-P. Hydrogen Overvoltage and Potential Build-Up at Copper Cathodes. A. K. Wiebe, W. Gauvin, and C. A. Winkler. *Canadian Journal of Chemistry,* v. 29, Apr. 1951, p. 301-307.

Experiments on the photo-electric effect in relation to adsorption of gases on the metal surface indicate the soundness of the belief that an adsorbed film of hydrogen is responsible for hydrogen overvoltage. 20 ref. (P15, Cu)

144-P. The Physics of Sheet Steel. (Continued). G. C. Richer. *Sheet Metal Industries,* v. 28, Mar. 1951, p. 223-227.

Power losses at high inductions of electrical steel sheets. (To be continued.) (P15, SG-h)

145-P. The Variation in Electrical Properties of Silicon-Iron Transformer Sheet; A Statistical Analysis of Data From a Single Cast. S. Rushton and D. R. G. Davies. *Journal of the Iron and Steel Institute,* v. 167, Mar. 1951, p. 247-261.

Based on 264 values from 11 ingots, and on iron-loss values of all the sheets produced from one ingot. Effect of a second anneal was studied, using analysis-of-covariance technique. Causes of variation in Fe losses. (P15, Fe)

146-P. Phenomenon of Reverse Inversion in Ferromagnetic Substances. (In Russian.) L. V. Kirenskii and V. F. Ivlev. *Doklady Akademii Nauk*

SSSR (Reports of the Academy of Sciences of the USSR), new ser., v. 76, Jan. 21, 1951, p. 389-391.

Investigated for annealed Ni. It was found that the number of reverse Barkhausen peaks may be as high as 35%. (P16, SG-p)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

175-Q. A Method of Numerical Analysis of Plastic Flow in Plane Strain and Its Application to the Compression of Ductile Material Between Rough Plates. R. Hill, E. H. Lee, and S. J. Tupper. *Journal of Applied Mechanics,* v. 18. *(Transactions of the American Society of Mechanical Engineers,* v. 73), Mar. 1951, p. 46-52. (Q24).

176-Q. Evaluation of Stress Distribution in the Symmetrical Neck of Flat Tensile Bars. Julius Aronofsky. *Journal of Applied Mechanics,* v. 18 *(Transactions of the American Society of Mechanical Engineers,* v. 73), Mar. 1951, p. 75-84.

Local strains and strain distribution in the necks of two flat tensile specimens of steel were measured. A strain hardening function for the material was obtained from results of tension tests on round bars. This strain hardening function and measured strains are used to determine stress distribution in the neck. Good agreement between calculated and the measured fracture load was obtained. 16 ref. (Q27, Q25, ST)

177-Q. Solution to the Rolling Problem for a Strain-Hardening Material by the Method of Discontinuities. Alice Winzer. *Journal of Applied Mechanics,* v. 18 *(Transactions of the American Society of Mechanical Engineers,* v. 73), Mar. 1951, p. 90-94.

Mathematical analysis and graphical interpretation. (Q25)

178-Q. Factors of Stress Concentration for Slotted Bars in Tension and Bending. M. M. Frocht and M. M. Leven. *Journal of Applied Mechanics,* v. 18, *(Transactions of the American Society of Mechanical Engineers,* v. 73), Mar. 1951, p. 107-108.

A concise presentation of data and information drawn chiefly from papers previously published. Results of photo-elastic analysis. (Q25, Q27, Q5)

179-Q. The Flow and Fracture of a Brittle Material. I. Cornet and R. C. Grassi. *Journal of Applied Mechanics,* v. 18, *(Transactions of the American Society of Mechanical Engineers,* v. 73), Mar. 1951, p. 120-122.

Discussion of paper by L. F. Coffin, Jr. (Sept. 1950 issue; item 654-Q, 1950). Includes author's closure. Data for gray cast iron are discussed. (Q23, Q26, CI)

180-Q. Creep of High-Purity Aluminum. *Technical News Bulletin,* (National Bureau of Standards), v. 35, Mar. 1951, p. 43-44. (Condensed from paper by Wm. D. Jenkins, *Journal of Research of the National Bureau of Standards,* v. 46, Apr. 1951. See item 205-Q.)

Curves show that plastic deformation of Al occurs in a discontinuous manner. Intergranular structure is illustrated. (Q3, Q24, Al)

181-Q. Prestressing Increases Aluminum Fatigue Life. *Iron Age,* v. 167, Mar. 22, 1951, p. 79.

Results of tests at National Bureau of Standards. (Q7, G23, Al)

182-Q. Mechanism of Primary Creep. Thomas G. Digges. *Metal Progress,* v. 59, Mar. 1951, p. 410, 412. (Condensed from "Mechanism of Primary Creep in Metals", W. A. Wood and R. F. Scrutton.)

Previously abstracted from *Journal of the Institute of Metals.* See item 665-Q, 1950. (Q3, Q24, Al)

183-Q. Fatigue Strength of Cold Worked Aluminum. *Metal Progress,* v. 59, Mar. 1951, p. 422. (Condensed from "The Use of Fatigue Tests in the Investigation of Structural Characteristics of Cold Worked Metals", R. Jacquesson and P. Laurent.)

Previously abstracted from *Revue de Métallurgie.* See item 3D-47, 1949. (Q7, Al)

184-Q. X-Ray Studies of Creep in Aluminum. Thomas G. Digges. *Metal Progress,* v. 59, Mar. 1951, p. 424. (Condensed from "The Mechanism of Creep as Revealed by X-Ray Methods", G. B. Greenough and Edna M. Smith.)

Previously abstracted from *Journal of the Institute of Metals.* See item 666-Q, 1950. (Q3, Q24, Al)

185-Q. How to Reduce Gear Failures. A. F. Brewer and P. J. Keating. *Steel,* v. 128, Mar. 26, 1951, p. 79-82.

Mechanisms of failure. Gear-oil additives and their functions. (Q9, S21, T7, ST)

186-Q. Photoelastic Stress Analysis Useful in Design of Metal Parts. Part I. Two-Dimensional Method. M. M. Leven. *Materials & Methods,* v. 33, Mar. 1951, p. 70-73.

The method and typical applications. (Q25)

187-Q. A Micro-Indentation Hardness Tester for Attachment to the Vickers Projection Microscope. S. J. Lloyd and D. J. Norris. *Journal of Scientific Instruments,* v. 28, Mar. 1951, p. 81-84.

Instrument for hardness tests with impression size of 5-10 μ. Extensive tests of the instrument have shown it to be accurate within the desired range. (Q29)

188-Q. Creep of High-Purity Aluminum Plotted. *Iron Age,* v. 167, Mar. 29, 1951, p. 89.

Recent work by W. D. Jenkins of National Bureau of Standards. (Q3, Al)

189-Q. The Effect of Grain Direction on Mechanical Properties of Light Alloy Extrusions. D. M. McElhinney. *Aircraft Engineering,* v. 23, Mar. 1951, p. 62-66.

Detailed results of experiments. Effect of stress concentrations on tensile strength in the various grain directions was also explored. Several British Al alloys (compositions given) were investigated. (Q24, Q25, Al)

190-Q. The Elastic Parameters of Beta-Brass. Robert A. Artman and Donald O. Thompson. *Journal of Applied Physics,* v. 22, Mar. 1951, p. 358.

As part of an investigation some of the physical properties of β-brass on and near the Cu-rich side of β-phase boundary, the elastic parameters of β-brass at 25° C. were measured. (Q21, Cu)

191-Q. Mechanism of Metallic Fracture. Georges A. Homes and Jacques Gouzou. *Engineers' Digest,* v. 12, Feb. 1951, p. 40-44. (Translated and condensed.)

Previously abstracted from *Revue de Métallurgie.* See item 825-Q, 1950. (Q26, Zn, CN)

192-Q. Statistical Aspects of Fatigue Strength. W. Weibull. *Engineers' Digest,* v. 12, Feb. 1951, p. 57-60. (Translated and condensed.)

Previously abstracted from *Teknisk Tidskrift.* See item 95-Q, 1950. (Q7)

193-Q. The Nimonic Series of Alloys. *Nickel Bulletin,* v. 23, Nov. 1950, p. 198-204.

Tabular data on physical and mechanical properties. Applications. (Q general, P general, T general, Ni)

194-Q. Frictional Properties of Tungsten Carbide and of Bonded Carbides. K. V. Shooter. *Research,* v. 4, Mar. 1951, p. 136-139.

Frictional properties of tungsten carbide and of four bonded carbides were investigated at slow sliding speeds and under heavy load. The surface damage when carbide and metal slide together is comparable with that found for other softer metals. The presence of Co in the bonded carbides does not produce any very great difference in behavior. Repeated stressing of the bonded carbide leads to a sudden increase of heavy wear and to a rise in friction. (Q9, C-n, W)

195-Q. Damaged Impressions in Microhardness Testing. P. Grodzinski. *Research,* v. 4, Mar. 1951, p. 140-141.

In a number of recent papers on microhardness testing, indentations have been illustrated in which there are irregular outlines due to cracking and splintering of the material under test; this impairs the accuracy of measurement. The author has designed a double-cone diamond indenter with which cracking is avoided under practically any load in the micro-macro range. (Q29)

196-Q. A Review of Some Electronic Instruments for Use in Industry. S. F. Smith. *Sheet Metal Industries,* v. 28, Mar. 1951, p. 247-255; disc. p. 255-256, 264.

Strain-measurement and vibration testing. Compares strain gages and extensometers. Stroboscopic equipment and its uses. (Q25, S general)

197-Q. Fundamental Aspects of the Cold Working of Metals. Maurice Cook and T. Ll. Richards. *Journal of the Institute of Metals,* v. 78, Jan. 1951, p. 463-482.

Nature of the metallic state and metallic cohesion in terms of the electron theory of metals. The various mechanisms involved in plastic deformation include crystallographic slip, twinning, and kinking, and a shear mechanism to which particular attention is drawn because of its importance in many metal fabrication processes. Influence of plastic deformation on structure with special reference to the development of preferred orientation. The effect of deformation on fine structure as revealed by x-ray diffraction and the relation of work hardening and plasticity to structural changes brought about by cold working. 37 ref. (Q24)

198-Q. Some Experiments on Phonograph Needles. (In Japanese.) Taro Hisada and Hideo Nagasu. *Journal of Mechanical Laboratory,* v. 4, Sept. 1950, 164-173.

Mechanical properties of phonograph needles were studied as well as methods for convenient measurements of these properties. Apparatus and results. (Q general, ST)

199-Q. Fatigue Strength and Damping Capacity of Timepiece Springs. (In Japanese.) Tetsutaro Mitsuhasi and Kazuo Tsuya. *Journal of Mechanical Laboratory,* v. 4, Sept. 1950, p. 180-185.

The relation between damping capacity and fatigue strength of timepiece springs. Results are summarized in English. (Q7, Q8, T7, ST)

200-Q. Form Effect (Gestalt-Festigkeit) of the Leaf Springs. (In Japanese.) Hisao Matsumoto and Kaoru Kamata. *Journal of Mechanical Laboratory,* v. 4, Sept. 1950, p. 186-190.

Effects of lowering the stress concentration of the center bolthole by changing hole shape and section shape. (Q25, T7, AY)

201-Q. Study on Application of Material. Mechanism of Tensile Failure of Induction-Hardened Steel. (Study of High-Frequency Quenching No. 3.) (In Japanese.) Hisao Matsumoto and Kat-

suyoshi Kimura. *Journal of Mechanical Laboratory,* v. 4, Sept. 1950, p. 196-200.

Data are tabulated, charted, and discussed. (Q27, J2, CN)

202-Q. Study of Wear of Steel Against Soil. II. (In Japanese.) Tetsutaro Mitsuhasi, Yutaka Imai, and Shin Yokoi. *Journal of Mechanical Laboratory,* v. 4, Dec. 1950, p. 291-298.

Results of study made to improve the wear of soil-tillage parts of agricultural implements are tabulated, charted, and summarized in English. A carbon steel was used. (Q9, CN)

203-Q. A Microhardness Tester for Metals at Elevated Temperatures. Abner Brenner. *Plating,* v. 38, Apr. 1951, p. 363-366.

Apparatus designed primarily for use on electrodeposits. Reproducibility was determined by measurements on a Mo specimen at room temperature, 400, 600, and 800° C. Other typical data are tabulated and charted. (Q29)

204-Q. Static Friction Tests With Various Metal Combinations and Special Lubricants. H. S. White and Dino Zei. *Journal of Research of the National Bureau of Standards,* v. 46, Apr. 1951, p. 292-298.

An inclined-plane apparatus was used in obtaining static-friction data for various lubricants with different metal combinations. Special lubricants, such as chlorinated and fluorinated hydrocarbons, were compared with a reference mineral oil. Effects of additives, such as graphite, molybdenum disulfide, zinc oxide, boron nitride, and an oxidized petroleum compound were investigated. Metal combinations involving stainless steels, carbon steel, cast iron, Al alloy, and Cr plate were used.
(Q9, SS, CN, CI, Al, Cr, SG-c)

205-Q. Creep of High-Purity Aluminum. William D. Jenkins. *Journal of Research of the National Bureau of Standards,* v. 46, Apr. 1951, p. 310-317.

A study was made of cold drawn Al at 105° F., to determine effects of variations of creep rate on mechanism of deformation. Extension on loading and extension at the beginning of the third stage both increased with increase in stress. Cyclic temperature changes appeared to increase the ductility. Discontinuous flow was evidenced in constant-load creep tests at 105° F. and in tensile tests at 80° F. Conformance to Andrade's law of transient flow was found within a limited range of strain rates. A mechanism of flow based on observed structural changes is proposed. 14 ref.
(Q3, Q24, Al)

206-Q. Applications of Bonded Wire Strain Gages. Francis G. Tatnall. *Tool Engineer,* v. 26, Apr. 1951, p. 28-31.

Survey includes several schematic diagrams. (Q25)

207-Q. Design and Calculation of Spot-Welded Joints Under Static Shear Loads. H. Zschokke and R. Montandon. *Engineers' Digest,* v. 12, Mar. 1951, p. 85-89. (Translated and condensed.)

Previously abstracted from *Schweizer Archiv für angewandte Wissenschaft und Technik.* See item 778-Q, 1950.
(Q2, Q27, K3, CN, SS, Al)

208-Q. Further Study of Metal Transfer Between Sliding Surfaces. J. T. Burwell and C. D. Strang. *National Advisory Committee for Aeronautics,* Technical Note 2271, Jan. 1951, 39 pages.

Study made to determine the role played by transfer of metal from one rubbing surface to another in the formation of characteristic surface coatings on certain piston-ring materials during run-in in an aircraft engine. Detection of this transfer was accomplished by a radioactive-tracer technique. Materials examined consisted of nitralloy steel, both nitrided and unnitrided, and several different types of Cr-plated surfaces. Effects on transfer of load, speed, distance of travel, repeated travel over the same path, hardness of the moving surface, and type of Cr plate were studied. Possible pretreatment to obtain a desirable surface layer might consist of running rings in a special cylinder having walls of selected composition and controlled hardness to give surface coatings of highly improved characteristics in a minimum length of time. 14 ref.
(Q9, AY, Cr)

209-Q. Creep of Lead at Various Temperatures. Peter W. Neurath and J. S. Koehler. *National Advisory Committee for Aeronautics,* Technical Note 2322, Mar. 1951, 32 pages.

A creep apparatus capable of measuring the stress-strain-time relation in the strain range 10^{-4} to 10^{-2} in. per in. with some accuracy and at temperatures down to that of liquid nitrogen was constructed. Single crystals of Pb were grown and oriented by X-ray analyses for testing. Some Cu and two Zn crystals were also grown and tested.
(Q3, Pb, Cu, Zn)

210-Q. Fatigue Testing Machines for Applying a Sequence of Loads of Two Amplitudes. Frank C. Smith, Darnley M. Howard, Ira Smith, and Richard Harwell. *National Advisory Committee for Aeronautics,* Technical Note 2327, Mar. 1951, 31 pages.

Construction, operation, and calibration of two nominally identical fatigue-testing machines built at the National Bureau of Standards. It is possible to measure continuously the loads once established to an accuracy of $\pm 3\%$. Preliminary tests made with these machines on Alclad, 75S-T, Al alloy sheet indicate that the loads once set remained constant to within $\pm 1\%$ for the necessary number of loading cycles. 17 ref. (Q7, Al)

211-Q. Cooperative Investigation of Relationship Between Static and Fatigue Properties of Heat-Resistant Alloys at Elevated Temperatures. *National Advisory Committee for Aeronautics,* Research Memorandum 51A04, Mar. 7, 1951, 51 pages.

A progress report by the NACA Subcommittee on Heat-Resisting Materials. Data from static tensile and rupture tests, combined dynamic and static stress tests, and completely reversed stress fatigue tests are reported at room temperature, 1000, 1200, 1350, and 1500° F. Results are summarized as curves of alternating stress vs. mean stress for fracture in 50, 150, and 500 hr. Some creep data under combined stress conditions and fracture characteristics of the specimens are included.
(Q4, Q7, SG-h)

212-Q. The Experimental Exploration of Plastic Flow in Sheet Metals. L. R. Jackson and W. T. Lankford. *American Society for Testing Materials,* "Symposium on Plasticity and Creep of Metals," 1950, p. 3-12; disc. p. 13-17.

Data for killed drawing steel, "vitrenamel" (a rimmed low-carbon steel), and copper. Shows that, when anisotropy in real materials is taken into account, some of the current theory appears to correlate flow results very well both in accounting for the stress required to maintain flow and in describing the distribution of strain resulting from various stress systems.
(Q24, Cu, CN, ST)

213-Q. Forming Parameters and Criteria for Design and Production. William Schroeder. *American Society for Testing Materials,* "Symposium on Plasticity and Creep of Metals," 1950, p. 18-36.

Generalized stress and strain; dimensional similarity; laws of fracture; classification of formed sheet-metal parts; basic types of forming action, including stretching, bending, and drawing; and significant parameters and criteria for these three types of forming. Data are tabulated and plotted for 24S-O Al-alloy and S-816 alloy. 24 ref.
(Q24, F general, G general, Al, SS)

214-Q. The Use of Creep Data in Design. Howard C. Cross and L. R. Jackson. *American Society for Testing Materials,* "Symposium on Plasticity and Creep of Metals," 1950, p. 37-47; disc. p. 48-49.

Describes creep data available at the present time for airplane applications and limitations in its interpolation and extrapolation. Types of additional data that would be of greatest usefulness in the design problems confronting designers in the use of metals for high-temperature service. 18 ref. (Q3, SG-h)

215-Q. Super Creep-Resistant Alloys. J. W. Freeman, D. N. Frey, E. E. Reynolds, and A. E. White. *American Society for Testing Materials,* "Symposium on Plasticity and Creep of Metals," 1950, p. 50-68.

Factors which control the creep and rupture strength of superalloys used in jet engines. Processing conditions, final treatment, and chemical composition. 28 ref.
(Q3, Q4, SG-h)

216-Q. A Method of Fatigue Testing Drill Rods. T. W. Wlodek. *Canadian Mining and Metallurgical Bulletin,* v. 44, Mar. 1951, p. 181-189; disc. p. 189-190; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 111-119; disc. p. 119-120.

Simplified method of fatigue testing full-dimension, as-rolled, non-machined, mining drill rods. The type of loading applied more or less simulates working conditions of the outside fibers of the drill rods. Additional advantages are the possibility of testing under dry and wet conditions, quietness, and ease of operation. S-N curves under dry conditions were determined for SAE 1080 Cr-Mo and Ni-Cr-Mo steels.
(Q7, CN, AY)

217-Q. The Effect of Shot Peening, and Shot Peening and Stress Relief, on the Fatigue Properties of SAE 1080 Steel. N. B. Brown. *Canadian Mining and Metallurgical Bulletin,* v. 44, Mar. 1951, p. 191-195; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 54, 1951, p. 121-125.

Effect of low-temperature stress relief at 232.2° C. Specimens were first annealed. One half of the bars were then normalized and the other half water-quenched and drawn. Specimens with each heat treatment were tested in tensile, notched-bar impact, and fatigue. Data are tabulated and charted. (Q7, G23, J1, CN)

218-Q. The Fatigue Strength of Welded 18-8 Steel at High Temperature. (In Swedish.) Ivar Weibull and Per Davidson. *Jernkontorets Annaler,* v. 134, no. 12, 1950, p. 559-571.

Investigated at 650° C. Four different steels were tested, of which two were stabilized with Ti, one with Cb and one (with a very low carbon content) unstabilized. Best results were obtained with a Ti-alloyed steel, free grain-boundary carbide and with a very low content of δ-ferrite in the weld zone. It is believed that Cb-alloyed steel would give at least as good results under similar conditions. 10 ref.
(Q7, SS)

219-Q. Exchange of Ideas on Schnadt's Notch-Impact-Testing Procedure (In Dutch.) *Smut Mededelingen,* v. 5, Oct.-Dec. 1950, p. 97-132; disc. p. 132-135.

Entire issue consists of discussions by different authors on theoretical considerations and practical results of above method. Principal contributors are J. H. Palm, J. A. Haringx, G. Westendorp, H. C. Goosens, and J. H. van der Veen. H. M. Schnadt and others participated in the informal discussion which follows the formal presentation. (Q6)

220-Q. Relationship of Cross-Sectional Area and Fatigue Strength for Different Materials. (In German.) H. Wiegand. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, Feb. 1, 1951, p. 89-91.

Effects of various factors on the above for different ferrous and nonferrous materials. (Q7)

221-Q. Research on the Strength of Sintered-Iron Compacts. (In German.) Georg Bierett and Theodor Hövel. *Stahl und Eisen,* v. 71, Jan. 18, 1951, p. 77-82.

Tensile tests on sintered-iron rings show that their strengths depend greatly on their i.d.-o.d. ratio and on pressure applied during the sintering process, as well as on grain size. 13 ref. (Q27, H15, Fe)

222-Q. Development and Status of Heat Resistant Rolled and Forged Steels. (In German.) Karl Bungardt. *Stahl und Eisen,* v. 71, Mar. 15, 1951, p. 273-281; disc. p. 281-283.

Various heat resistant steels and the effect of additions (such as Ti) on their mechanical and oxidation resistance properties. 30 ref. (Q general, R2, AY, SG-h)

223-Q. Hardness Testing With Asymmetrical Indenters. (In German.) H. Meincke. *Metalloberfläche,* v. 5, ser. A, Feb. 1951, p. 17-21.

On comparing the effect of different indenters in the hardness testing of monocrystals and anisotropic substances, it was found that more accurate results could be obtained with one-dimensional indenters and that the resulting hardness readings can be more readily correlated with tensile strengths. 15 ref. (Q29)

224-Q. Fracture of a Heavy Cast-Steel Drive Wheel. (In German.) Hermann Schropp. *Giesserei,* v. 38 (new ser., v. 4), Jan. 25, 1951, p. 33-34.

Analysis of the fracture indicated the cause to be hot shortness, most probably caused by delay in removal of the casting from the mold and improper design. The high impact brittleness may be the result of annealing too long or at too high a temperature. (Q26, CI)

225-Q. Wear Testing by Means of a Machine Using Mineral Abrasives. (In German.) H. Timmerbeil. *Giesserei,* v. 38 (new ser., v. 4), Feb. 8, 1951, p. 52-54.

Machine shows that the wear resistance of parts and revolving plates subject to wear can be vastly improved by weld deposition of hard metals. Includes photographs and graphs showing the relative effect of different hard-metal deposits on wear resistance. (Q9, L24)

226-Q. The Effect of Sulfur and Iron on Binary Lead Bronzes. (In German.) A. Rühenbeck. *Giesserei,* v. 38 (new ser., v. 4), Mar. 8, 1951, p. 103-106.

Investigated because of the increased use of scrap metal for Pb bronze bearings. It was found that the optimum Pb:S ratio is 100:1 and that Fe in excess of its solubility limit in Cu produces a spherical, fine-grained structure with above-average strength and bearing properties. (Q23, M27, Cu, SG-c)

227-Q. The Further Development of Al-Zn-Mg Alloys for Use in Sheet Metal and Rivets. (In German.) H. G. Petri, G. Siebel, and H. Vosskühler. *Metall,* v. 5, Feb. 1951, p. 47-52.

Sheets containing 4.5% Zn, 3.5% Mg, 0.3% Cu, 0.3% Mn, 0.15% Cr, and 0.05% V were found to have adequate strength properties; to be almost completely stress-corrosion resistant; but are insufficiently malleable, except when freshly solution annealed. Two new alloys have higher malleability and satisfactory properties. 17 ref. (Q23, R1, Al)

228-Q. Equalization of Measuring Errors in G. Sachs's Boring Process for Detection of Internal Stresses in Bars and Tubes. (In German.) H. Böhler and W. Schreiber. *Metall,* v. 5, Feb. 1951, p. 53-57.

An improvement of Sachs's method for determining 3-dimensional stresses by mathematical instead of graphical means. 10 ref. (Q25)

229-Q. Local Strength of Extruded Shapes. II. Shapes With "Wood Fiber" Fracture. (In German.) H. Kostron. *Metall,* v. 5, Feb. 1951, p. 58-63.

Formation of fractures which resemble cracks in wood. These are formed by aggregation of intermetallic compounds. Tests were made to determine effects of these aggregates on local strength properties of extruded Al-base alloys containing Cu and Mg. A casting procedure which practically eliminates the difficulty. (Q26, E25, Al)

230-Q. Alternating-Stress Hardness; Concept and Method of Measurement. (In German.) W. Späth. *Metall,* v. 5, Mar. 1951, p. 98-101.

Critical discussion of static hardness tests. Testing equipment and procedure for determining hardness changes resulting from compression stresses applied in rapid succession. Data for six plain carbon and alloy steels, also for brass and Al. (Q29, CN, AY, Al, Cu)

231-Q. Ten Zirconium Alloys Evaluated. F. B. Litton. *Iron Age,* v. 167, Apr. 5, 1951, p. 95-99; Apr. 12, 1951, p. 112-114.

Mechanical and oxidation resistance properties of zirconium alloyed with 10 different elements including O_2 and N_2. Hf up to 8.2% did not affect tensile properties. Al increased strength as did Ti, Cb, O_2, and N_2. In general Zr alloys are not as resistant to oxidation as the commercially pure metal. Minor amounts of Al and N_2 decreased, while O_2 slightly increased, oxidation resistance. Arc-melted metal had better resistance to oxidation than did induction or graphite-crucible-melted Zr. (Q23, R2, Zr)

232-Q. Report of Ship Structure Committee. *Welding Journal,* v. 30, Apr. 1951, p. 169s-181s.

Second of a series of technical progress reports to the Secretary of the Treasury by the Ship Structure Committee. Materials, fabrication, locked-in stress, design, and statistical report of structural performance of steel merchant vessels. 14 ref. (Q25, S12, CN)

233-Q. Some Metallurgical Aspects of Ship Steel Quality. R. W. Vanderbeck. *Welding Journal,* v. 30, Apr. 1951, p. 192s-194s.

Discusses paper by H. M. Banta, R. H. Frazier, and C. H. Lorig. (Feb. 1951 issue; item 95-Q, 1951.) (Q23, T22, CN)

234-Q. Statistical Analysis of Tests of Charpy V-Notch and Keyhole Bars. J. A. Rinebolt and W. J. Harris, Jr. *Welding Journal,* v. 30, Apr. 1951, p. 202s-208s.

Analysis which established the degree of fluctuation of energy and of transition temperatures of steels prepared in the laboratory, having compositions close to 0.30% C, 1.00% Mn, and 0.30% Si. (Q6, CN)

235-Q. Compression Test Extensometer for Cylinder Specimens. A. M. Stott and J. M. McCaughey. *Product Engineering,* v. 22, Apr. 1951, p. 157-160.

Development of an instrument for obtaining accurate stress-strain data when testing cylindrical specimens in compression. It can be used for ferrous and nonferrous materials at temperatures ranging from −70 to 400° F. (Q28)

236-Q. Photoelastic Stress Analysis Useful in Design of Metal Parts. Part 2. Three-Dimensional Photoelasticity. M. M. Leven. *Materials & Methods,* v. 33, Apr. 1951, p. 89-92.

The relatively new "frozen stress" technique, said to be ideal where it is difficult to use other methods of experimental stress analysis. (Q25)

237-Q. The Hardness and Strength of Metals. D. Tabor. *Journal of the Institute of Metals,* v. 79, Mar. 1951, p. 1-18.

Using a spherical indenter of fixed diameter to make hardness indentations, as in the Brinell test, it was found that the load necessary to produce an indentation of a certain chordal diameter *d* is given by the relationship which depends on degree of work hardening of the metal. Shows that the stress-strain curve of the metal may be derived from the hardness measurements. A series of curves shows the variation of the ratio of tensile strength to hardness with Meyer index. Materials as diverse as tool steel, work hardened Ni, and annealed Cu all lie near the theoretical curves. A similar analysis is given for pyramidal indenters such as used in making Vickers hardness measurements. 10 ref. (Q29, Q23)

238-Q. (Pamphlet) **Symposium on Plasticity and Creep of Metals.** 68 pages. 1950. *American Society for Testing Materials.* Special Technical Publication 107, 1950. 68 pages. $1.50.

Introduction by John E. Dorn and four papers which are abstracted separately. (Q23, Q3, Al, Cu, ST)

239-Q. (Book) **The Friction and Lubrication of Solids.** F. P. Bowden and D. Tabor. 337 pages. 1950. Clarendon Press, Oxford, England.

An experimental study of the physical and chemical processes that occur during the sliding of solids—particularly of metals—and an investigation into the mechanism of friction and boundary lubrication. Physical properties of solid surfaces. Chapter bibliographies. (Q9)

240-Q. (Book) **Estado Actual del Promblema de la Rotura de los Metales.** (The Present Position as Regards the Failure of Metals.) Carlos Fernandez Casado. 87 pages. Instituto de la Soldadura, Madrid, Spain.

The four principal criteria for failure—maximum principal stress, maximum dilation, maximum shear stress, and maximum energy of deformation—are compared and a provisional theory of failure is advanced. The phenomena of failure in simple tension, plastic flow in single crystals and polycrystalline materials; and factors influencing the development of failure. Includes list of some 100 technical terms in Spanish, English, German, French, and Italian. (Q23)

R — CORROSION

147-R. The Role of Sodium Silicate in Inhibiting Corrosion by Film Formation on Water Piping. Leo Lehrman and Henry L. Shuldener. *Journal, American Water Works Association,* v. 43, Mar. 1951, p. 175-188.

Solutions of different sodium silicates in very low concentration (12-1400 ppm. SiO_2) are shown to achieve an equilibrium between ionic and colloidal silica. Silica is not removed from these solutions by metals until the solid corrosion products of metals form. The siliceous film which inhibits the corrosion process was identified by chemical analysis, microscopic examination, and X-ray diffraction analysis. Describes the film formed by the adsorption compound in galvanized iron and brass piping during service. 11 ref. (R10, Fe)

148-R. Corrosion Resistance of Wrought Iron and Steel Pipe. S. L. Case. *Metal Progress,* v. 59, Mar. 1951, p. 378-384.

Data which indicate that wrought iron and steel do not differ materially in their behavior under corrosive conditions in the soil, concrete, and other environments surrounding radiant heating panels. Differences in corrosion resistance of various wrought irons are often greater than between steel and wrought iron. (R8, Fe, ST)

149-R. Corrosion of Magnesium Alloys. *Metal Progress,* v. 59, Mar. 1951, p. 408. (Condensed from "Stress-Corrosion of Wrought Magnesium Base Alloys", Hugh L. Logan and Harold Hessing.

Previously abstracted from *Journal of Research of the National Bureau of Standards.* See item 175-R, 1950. (R1, Mg)

150-R. Cost of Corrosion. *Metal Progress,* v. 59, Mar. 1951, p. 414, 416, 420. (Extracts from "The Cost of Corrosion to the U. S.", Herbert H. Uhlig.)

Previously abstracted from *Chemical and Engineering News.* See item 6A-118, 1949. (R general, A4)

151-R. Materials of Construction vs. Citric Acid. *Chemical Engineering,* v. 58, Mar. 1951, p. 211-212, 214, 216, 218-220, 222.

Consists of the following brief items: "Worthite," W. E. Pratt; "Coatings," Kenneth Tator; "Cements," Raymond B. Seymour; "Wood," Henry B. Smith; "Glass-Lined Steel," S. W. McCann; "Lead," Kempton H. Roll; "Rubber Lining," J. P. McNamee; "Porcelain," W. V. Lapp; "Silicones," J. A. McHard and J. T. McIntyre; "Tantalum," Leonard R. Scribner; "Iron & Steel," Albert W. Spitz; "Durimet 20," Walter A. Luce; "Chlorimets," Walter A. Luce; "High-Silicon Irons," Walter A. Luce; "Aluminum," A. B. McKee; "Stainless Steel," Grant L. Snair, Jr.; "Nickel & Nickel Alloys," W. Z. Friend; "Carbon," J. F. Revilock; "Stoneware," F. E. Herstein; "Porcelain," W. V. Lapp; and "Hastelloy," Edward D. Weisert. (R5)

152-R. Corrosion Control for Cooling Systems of Electric Apparatus. Emil J. Remscheid. *General Electric Review,* v. 54, Mar. 1951, p. 36-40.

Experience indicates that where a coolant circuit is necessary for an essentially iron system the application of anhydrous sodium chromate provides a positive and economical means of preventing corrosion. (R10, ST)

153-R. The Oxidation of Heat-Resistant Alloys in the Presence of Foreign Oxides. J. L. Meijering and G. W. Rathenau. *Philips Technical Review,* v. 12, Feb. 1951, p. 213-220.

Alloys which are protected against corrosion by a dense skin of oxide sometimes show strongly accelerated oxidation when brought into contact with foreign oxides. Oxidation of a series of metals and alloys, based on Fe, Cu, or Ag, was investigated, by bringing into contact with MoO_3 in powder form. Degree of oxidation (penetration depth) was determined by measuring the breaking strength of wires drawn from the respective material and heated in air with and without contact with MoO_3. It is concluded that accelerated oxidation is due to formation of liquid in the protective oxide skin of the alloy. It was possible to explain many peculiarities in the temperature and time dependency of the oxidation. (R1, SG-h)

154-R. The Oxidation of Copper at 350°-900° C. in Air. R. F. Tylecotte. *Journal of the Institute of Metals,* v. 78, Dec. 1950, p. 327-350.

Oxidation rates were measured by a continuous-weighing method. At 615° C. and higher, the coppers oxidize according to parabolic law, and the rate constants are similar for the two types. At lower temperatures, initial stages of oxidation depart significantly from the parabolic mode and the oxidation probably follows a logarithmic law, the rates again being similar for the two types of Cu. However, as the scale thickens, the oxidation conforms more nearly to the parabolic law. 18 ref. (R2, Cu)

155-R. From a Metallurgist's Notebook: Stained Zipper Elements. H. H. Symonds. *Metal Industry,* v. 78, Mar. 9, 1951, p. 187-188, 193.

Failure of zipper elements or teeth by season cracking. The necessary corrosive environment was provided by the free fatty acids present in the leather boots to which the zippers were fitted, and by conditions of storage. Materials were either brass or Ni-plated steel. (R7, Cu, Ni, ST)

156-R. Principles of Air Purification. (In German.) H. Stäger. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 17, Jan. 1951, p. 1-22.

Methods for study of air-borne solids and their effects on living and inert matter, including corrosion and wear of structures and moving parts exposed to air. Climate and climatology; air as a disperse system; effect of particle-size in processing methods; and of filtration as a separation process. Influence of dust content on behavior of an internal combustion engine. Photographs show wear and corrosion of piston surfaces with and without air and oil filtration. 36 ref. (R3)

157-R. Cathodic Protection of an Active Ship in Sea Water. Part II. K. N. Barnard. *Corrosion* (Technical Section), v. 7, Apr. 1951, p. 114-117.

Appearance of a ship placed in drydock 11 months after Mg anodes were fitted to each bilge keel. No corrosion was observed, except in a few re-entrant places. General condition of the underwater paint was fair and the ship was relatively free from fouling growth. The results show that it is possible and practical to use Mg anodes to protect cathodically an active ship in sea water and that measurement of the "hull potential" is an effective criterion as to how much current should be applied at a given time. (R10, ST)

158-R. Inhibitor Control for Sulfide Corrosion. J. A. Caldwell. *World Oil,* v. 132, Apr. 1951, p. 191-192.

Results of liquid-inhibitor tests in wells with previous histories of many equipment failures demonstrate effectiveness of inhibtor use where margin between production cost and production volume is such that more costly means of control are uneconomic. (R10, ST)

159-R. Corrosion Mitigation in the North McCallum Field. Part 2. Conclusion. C. C. Frye, W. L. Giezentanner, and Fred M. Clement. *World Oil,* v. 132, Apr. 1951, p. 214, 217-218, 220.

Results obtained through the use of commercial inhibitors compared to bare tubing and strings coated with plastics. Findings indicate that liquid inhibitors are effective and that plastic-coated strings are of economic value in reducing the amount of inhibitor required. (R10, ST)

160-R. Effect of Chromium on the Oxidation Resistance of Titanium Carbide. J. D. Roach. *Journal of the Electrochemical Society,* v. 98, Apr. 1951, p. 160-165.

It was found that a small percentage of Cr in recrystallized TiC improves resistance to oxidation at elevated temperatures. Amount of oxidation was determined by increase in weight of specimens of different Cr content after heating in air 650, 850, 1200, and 1400° C. Results show that maximum oxidation resistance, at each temperature, is obtained by addition of 5% Cr. 18 ref. (R2, Ti, C-n)

161-R. A User's Viewpoint—Corrosion Data Helps Select Ventilation Equipment. Joseph W. McWilliams. *Standardization,* v. 22, Apr. 1951, p. 111-114.

Surveys available information and discusses its application. (R general, T27)

162-R. From a Metallurgist's Notebook: Capsule Corrosion. H. H. Symonds. *Metal Industry,* v. 78, Mar. 23, 1951, p. 233.

Investigation of the corrosion of brass or copper capsules fitted to barometers. Various tests were carried out on samples of two liquids with which these capsules were filled in order to determine whether they would cause corrosion or staining. (R5, Cu)

163-R. The Effect of Different Alloying Elements on the Technological Properties of Cast Iron, Especially Its Heat Resistance. (In German.) H. Timmerbeil. *Giesserei,* v. 38, (new ser., v. 4), Jan. 25, 1951, p. 25-29.

Correlates and summarizes data on composition of cast air-heater pipes, compares the thermal resistance and castability of several Al-Si and Cr-Si alloys, and shows the beneficial effects of Ni and Mo. (R2, E25, CI)

164-R. The Theory of Scaling on Metal Alloys. (In German.) Karl Hauffe. *Metalloberfläche,* v. 5, ser. A, Jan. 1951, p. 1-7.

On the basis of Frenkel's model of formation of holes, scaling is explained as a migration of ions by way of interstitial lattice vacancies. Quantitative relations are explained by the Wagner-Schottky theory. 24 ref. (R2)

165-R. The Problem of the Corrosion of Armatures in Contact With Impregnated Wood. (In German.) F. Moll. *Werkstoffe und Korrosion,* v. 2, Jan. 1951, p. 14-15.

The inadequacy of short-time laboratory tests on wood preservatives, since it was found in practice that they often promote, rather than inhibit, the corrosion of metals joined to, or in contact with, the wood. A corrosion-preventive treatment for wire nails. (R7, R10)

166-R. Rust and Scale Prevention in Hot-Water Plants. (In German.) G. Seelmeyer. *Werkstoffe und Korrosion,* v. 2, Jan. 1951, p. 17-30.

Comprehensive review of the causes of corrosion and scaling includes preventive measures. 34 ref. (R4, ST)

167-R. Literature Survey on Corrosion in Neutral Unaerated Oil Well Brines. H. R. Copson. *Corrosion* (Technical Section), v. 7, Apr. 1951, p. 123-127.

Steel is the only material considered. 46 ref. (R7, ST)

168-R. Addendum: Corrosion Problems in the Modern By-Product Coke Plant. E. A. Tice. *Corrosion* (Technical Section), v. 7, Apr. 1951, p. 128.

Additional spool-test data on three leads, high-Ni alloys, bronzes, stainless steels, cast irons, and mild steel. (Original article appeared in Mar. 1950 issue; see item 119-R, 1951.) (R7, Pb, Ni, Cu, CN, SS)

169-R. Corrosion Resistant Equipment for the Corn Refining Industry. R. W. Flournoy. *Corrosion* (Technical Section), v. 7, Apr. 1951, p. 129-133; disc. p. 133.

A process flow sheet indicates steps for which corrosion data were determined. Corrosion data for starch, dextrose, and by-product manufacture were taken from field and laboratory corrosion tests. Special techniques for determining effect of pitting, intergranular corrosion of welds, and applied stress were used. Determination of metallic contamination by a corrosion test; economic factors employed in evaluating the corrosion data. Corrosion rates and corrosion cost-index values are shown in tables for a number of process steps in the industry. (R11, T29)

170-R. Tower Footing Corrosion. Walter J. Piper and John D. Piper. *Corrosion* (Technical Section), v. 7, Apr. 1951, p. 134-140.

Refers to high-voltage transmission towers. Measurement of tower-to-soil potentials was used to indicate condition of the galvanizing on underground portions of these towers. Results of an extensive study of the effects of various factors are tabulated. (R8, ST)

171-R. Discussions. *Corrosion* (Technical Section), v. 7, Apr. 1951, p. 141-143.

Covers "Application of Corrosion Resisting Materials to Railroad Electrical Construction," H. F. Brown, Aug. 1950 issue; and "The Role of Polarization in Electrochemical Corrosion," R. H. Brown, G. C. English, and R. D. Williams, June 1950 issue. Includes authors' replies. (R general)

172-R. New Corrosion Research Facilities Added to Inco Kure Beach Project. *Journal of Southern Research,* v. 3, Mar.-Apr. 1951, p. 6-8. (R11)

173-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 43, Apr. 1951, p. 71A-72A, 74A.

New method for measuring the high-temperature oxidation of iron proposed as a result of a metallographic investigation. (R2, R11, Fe)

174-R. Aqueous Nonflammable Hydraulic Fluids. J. E. Brophy, V. G. Fitzsimmons, J. G. O'Rear, T. R. Price, and W. A. Zisman. *Industrial and Engineering Chemistry,* v. 43, Apr. 1951, p. 884-896.

Research which led to development of nonflammable hydraulic fluids designated as Hydrolubes. The large number of metals occurring in aircraft hydraulic systems posed a difficult problem in corrosion inhibition. However, suitable liquid-phase and vapor-phase inhibitors were found. Wear-reducing additives were developed of the type forming hydrophobic films on steel. 18 ref. (R10)

175-R. Corrosion Mitigation Viewed by Management. H. H. Anderson. *Petroleum Engineer,* v. 23, Apr. 1951, p. D30, D32-D34.

Economic importance of corrosion mitigation in the oil industry. (R7)

176-R. The Quantitative Removal of Corrosion Products From Zinc. E. G. Stroud. *Journal of Applied Chemistry,* v. 1, Mar. 1951, p. 93-95.

In order to estimate quantitatively the corrosion of Zn by the loss in weight of metal, corrosion products were removed by immersion of the corroded metal in a cold solution of 10% chromic anhydrite to which was added 2% silver chromate and excess strontium chromate. The method, while permitting removal of heavy deposits of corrosion product, prevents attack on the base metal such as would be produced by chlorides and sulfates in the deposit in the presence of chromic acid. (R11, Zn)

177-R. Electrolytic Corrosion Tests in Pressure-Sensitive Electrical Tapes. C. W. Bemmels, Rudolf J. Priepke, and L. D. Fallon. *Electrical Manufacturing,* v. 47, Apr. 1951, p. 129-131, 248, 250, 252, 254.

Pressure-sensitive electrical tapes are used as a means of holding wires and other elements during assembly. The term "electrolytic corrosiveness" refers to the tendency of a tape to corrode copper as a result of current flow when insulating materials are subjected to an electrical potential, particularly in the presence of moisture. Comparison of test methods leads to the conclusion that the "corrosion current" method is preferred. It gives good correlation with a second test method designed to simulate corrosiveness of the test material in contact with enameled wires. (R11, Cu)

178-R. A Study of Several Physical Properties of Electrolytes Over the Temperature Range of 25° C. to −73° C. A. B. Garrett and Samuel A. Woodruff. *Journal of Physical & Colloid Chemistry,* v. 55, Apr. 1951, p. 477-490.

Density, viscosity, electrical conductivity, and freezing point of several solvent-electrolyte systems over the above range. Such data are of specific interest in study of electrolytes and especially in study of the dissolution of metals over this temperature range. (R2, P general)

179-R. Action of Hot Ionized Gases Upon Zirconium and Copper. Andrew Dravieks. *Journal of Physical & Colloid Chemistry,* v. 55, Apr. 1951, p. 540-549.

By measuring changes in electrical resistance, relative reaction rates of Zr at 986° C. with low-pressure nonionized and ionized oxygen, air, water vapor, CO_2, CO, N_2 containing 0.5% O_2, C_2H_6, and technical He were studied. In some cases an acceleration and in others a retardation of the reaction upon ionizing the gas was observed. Oxidation of Cu in both forms of gases was studied at 750° C. A method of recording continuously the progress of oxidation of metal strips. 31 ref. (R2, P13, Zr, Cu)

180-R. (Pamphlet) **Diamond Chromium Chemicals; General Use and Applications.** 1949, 32 pages. *Diamond Alkali Co.,* Union Commerce Bldg., Cleveland.

Bichromate of soda and methods for its analysis, leather tanning, dry colors, dyes, textiles, bichromate dip in the surface treatment of brass and copper, chromic acid, corrosion prevention, wood preservatives, etc. (R10, L14, Cu)

S

INSPECTION AND CONTROL

130-S. Television in Industry. J. A. Good. *Iron and Steel Engineer,* v. 28, Mar. 1951, p. 107-110; disc. p. 110-111.

Possible applications in the steel plant for communication and control purposes. (S18)

131-S. The Determination of Chrysocolla in Copper Ores. R. S. Young and H. R. Simpson. *Mining Magazine,* v. 84, Mar. 1951, p. 137-139.

Since chrysocolla is not recovered by froth flotation, it is sometimes desirable to determine this mineral rapidly in Cu ores or tailings. Based on the fact that chrysocolla is considerably lighter than other common minerals, a simple procedure is described for determination of this constituent which involves separation in tetrabromoethane followed by the usual chemical analysis for Cu. (S11, Cu)

132-S. Review of Tracer Techniques in Metallurgy. G. H. Guest. *Metal Progress,* v. 59, Mar. 1951, p. 366-370.

Use to solve problems in ore dressing, smelting and refining, utilization of materials, and physical metallurgy. (S19)

133-S. Intelligent Testing and Inspection of Forgings Assures High Quality at Lower Cost. Lester F. Spencer. *Materials & Methods,* v. 33, Mar. 1951, p. 77-80.

Use of dimensional checking, metallurgical examination, and physical and nondestructive testing for evaluating plain-carbon, alloy, and stainless steel forgings during manufacture. (S13, S14, ST)

134-S. Substitute Grades Suggested for Scarce Stainless Steel. Kenneth Rose. *Materials & Methods,* v. 33, Mar. 1951, p. 87-88.

Acceptable alternates for conventional welding grades and Ni-bearing types. (S22, SS)

135-S. A Simple Temperature-Controlled Laboratory Furnace. R. S. Barnes. *Journal of Scientific Instruments,* v. 28, Mar. 1951, p. 89-92. (S16, M23)

136-S. Designation of Metallic Surfaces. Part I. Helmut Thielsch and George Stroman. *Metal Finishing,* v. 48, Sept. 1950, p. 66-70.

First of a series explaining the fundamentals behind the measurement of surface qualities. Surface roughness, waviness, and lay (direction of the predominant surface pattern). Methods for rating surface roughness and surface waviness, and for converting one roughness value to another. 19 ref. (S15)

137-S. Determination of Sodium and Potassium in Lithium Metal by Flame Photometer. W. R. Inman, R. A. Rogers, and J A. Fournier. *Analytical Chemistry,* v. 23, Mar. 1951, p. 482-483.

The unusual properties of Li metal have caused recent interest in its use in metallurgy. Na and K are the chief impurities usually found. The method could be modified for the determination of Na and K in certain light alloys. (S11, Li, Na, K)

138-S. Colorimetric Determination of Rhenium. Emil E. Malouf and Merwin G. White. *Analytical Chemistry,* v. 23, Mar. 1951, p. 497-499.

Method for quantitative colorimetric determination of Re in samples containing as little as 0.1 microgram to 2.5 mg. per gram of sample. Determinations have been made in the presence of 125 mg. of Mo in a volume of 25 ml. The method is readily applicable to routine analytical laboratories. (S11, Re)

139-S. Colorimetric Determination of Nickel With Alpha-Furildioxime. A. R. Gahler, A. M. Mitchell, and M. G. Mellon. *Analytical Chemistry,* v. 23, Mar. 1951, p. 500-503.

Compares above with use of dimethylglyoxime or 1,2-cyclohexanedionedioxime. Applicability was shown by determination of Ni in a Mg alloy and in a NBS steel sample. 10 ref. (S11, Ni)

140-S. Precision Colorimetry; Application to Determination of Manganese. Irving G. Young and C. F. Hiskey. *Analytical Chemistry,* v. 23, Mar. 1951, p. 506-508.

The method developed utilizes periodate oxidation of Mn followed by a comparison of the unknown with the known solution of high absorbance. Data establish limits of precision and accuracy of the meth-

od when applied to pyrolusite ores. 14 ref. (S11, Mn)

141-S. Manual of Analytical Methods for the Determination of Uranium and Thorium in Their Ores. *New Brunswick Laboratory, U. S. Atomic Energy Commission,* Sept. 1950, 55 pages.

Chemical methods for the analysis of pitchblende, carnotite-bearing sandstone, shales, phosphate rock, and monazite sands. (S11, U, Th)

142-S. Methods of Testing Lacquer Coatings on Tinplate. W. E. Hoare. *Sheet Metal Industries,* v. 28, Mar. 1951, p. 231-233, 244.

Methods for measurement or estimation of continuity, thickness, adhesion, and hardness. 17 ref. (S15, L17, Sn, CN)

143-S. Metallurgical Polarographic Analysis; Polarometric Titrations. Jaroslav Heyrovsky. "Physical Methods in Chemical Analysis." Vol. II. Academic Press, New York, 1951, p. 1-49.

History, theory, apparatus, techniques of investigating solutions, sensitivity, and accuracy. Numerous applications. 58 ref. (S11)

144-S. Electrography and Electro-Spot Testing. H. W. Hermance and H. V. Wadlow. "Physical Methods in Chemical Analysis." Vol. II. Academic Press, New York, 1951, p. 155-228.

Equipment, materials, manipulative techniques, electrolytes, reagents, and developing processes. A variety of applications, including electro-spot testing for identifying pure metal surfaces, alloys, and anions; electrography for recording distributive patterns; and many others. Includes diagrams, photographs, tables, graphs, and electrographs. 49 ref. (S11, S10)

145-S. Magnetic Methods of Analysis. A. R. Kaufmann. "Physical Methods in Chemical Analysis." Vol. II. Academic Press, New York, 1951, p. 229-254.

Magnetic energy, force, and materials; production and measurement of magnetic fields; and apparatus for magnetic measurements. Magnetic test methods applied to oxygen in air, C in steel, phase transformations, single crystals, molecular structure, etc. 44 ref. (S11, M23)

146-S. Vacuum Techniques and Analysis. Benjamin B. Dayton. "Physical Methods in Chemical Analysis." Vol. II. Academic Press, New York, 1951, p. 333-386.

Methods of assembly and operation of vacuum systems constructed with the aid of modern diffusion pumps and unit parts available from manufacturers of scientific glass apparatus and vacuum equipment. The vacuum-fusion method for the analysis of gaseous elements in metals, determination of C by the low-pressure combustion method, microanalysis of gases, and analytical molecular distillation. Reviews the literature. 227 ref. (S11)

147-S. Design and Manufacture of Pressure Vessels. *International Chemical Engineering & Process Industries,* v. 32, Mar. 1951, p. 111-115.

Manufacturer's and users' views on British Standard 1500/1949. (S22, T26)

148-S. Methods of Measurement and Definition of Surfaces. (Concluded.) H. Becker. *Microtecnic* (English Ed.), v. 4, Nov.-Dec. 1950, p. 302-307. (Translated from the German).

German instruments and techniques. (S15)

149-S. Production Problems. II. Failure of Welt Needles. *Iron and Steel,* v. 24, Mar. 1951, p. 83-85.

Because of the premature breakages of welt needles of English manufacture, as compared with the behavior of American needles, a certain footwear manufacturer considered it desirable to have a complete metallurgical examination carried out to try to account for the difference in working life. Includes composition, surface finish, shape, hardness tests, pickling tests, and microstructures. Recommendations. (S21, CN)

150-S. Copper in White Metals; A Photometric Method of Determination. W. C. Coppins and J. W. Price. *Metal Industry,* v. 78, Mar. 16, 1951, p. 203-204.

Possibilities of direct determination of Cu and Fe by measurement of the color of the complex bromides. (S11, Sn, Pb, Sb, Cu)

151-S. Gamma Radiography in Shipbuilding and Engineering. J. D. Hislop. *Engineer,* v. 171, Mar. 16, 1951, p. 327-330.

Procedures and equipment. Fundamental principles. (S13)

152-S. Study of Surfaces of Castings. VIII. Measuring Methods for Casting Surfaces. (In Japanese.) Kazuo Katori, Tsuneyuki Okakura, and Kenji Hashimoto. *Journal of Mechanical Laboratory,* v. 4, Dec. 1950, p. 304-308.

The light cross-section method and tracer method were used. Comparative results. (S15)

153-S. Study of the Superfinishing Mechanism. I. (In Japanese.) Atsushi Inoue. *Journal of Mechanical Laboratory,* v. 4, Dec. 1950, p. 314-318.

The methods tested were the tracer method (magnification 1000 and 15,000), optical and electron-microscopic method, optical-reflection method (NF roughness tester) and interference method. Advantages and disadvantages of each. The last one was selected as best from the viewpoint of accuracy. (S15)

154-S. Isotopes at Work. Frank Charity. *Modern Machine Shop,* v. 23, Apr. 1951, p. 196-198, 200, 202, 204, 206, 208.

Some of the more interesting present-day industrial applications, especially in metallurgy and metalworking. 10 ref. (S19)

155-S. Measuring Thickness of Thin Coatings by Backscattering. *Electronics,* v. 24, Apr. 1951, p. 226, 228, 230.

Through the use of the system described, the following measurements are made possible: Sn or Zn on steel, paint or lacquer on metallic surfaces, rubber and plastic on calendering rolls, Se or Al or other backing materials, Ba coating on photographic paper, Cr or brass on steel, fillers in paper and plastics, porcelain coatings, metal surfaces, and plastic coatings on wire. (S14)

156-S. Development, Present State, and Outlook of Spot Test Analysis. Fritz Feigl. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 1-11. (Translated from the German.)

A general review. 37 ref. (S10)

157-S. Electro Spot Testing and Electrography. H. W. Hermance and H. V. Wadlow. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 12-34.

History, apparatus, operation, effects of treatment on metals, and applications of the above testing methods. Behavior of Pb, Fe, Cu, Ag, Ni, Co, Mo, Cr, Sn, Cd, Zn, Al, Mn, steels, and nonferrous alloys under various treatments. Diagrams and photographs of equipment, and electrographs of specimens after treatment. 10 ref. (S10, S11)

158-S. Instruments for Rapid Metal Identification. R. R. Webster. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 35-48.

Instruments used in laboratories, manufacturing operations, and in the field for analysis of metals. Properties found useful in identification. Photographs of instruments and graphs showing typical instrument readings. 11 ref. (S10)

159-S. Separating Alloys by Relative Spot Tests. H. Kirtchik. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 49-53.

Applications to a wide variety of ferrous and nonferrous alloys. (S10)

160-S. Rapid Methods for the Identification of Copper-Base Alloys. R. P. Nevers. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 54-57.

Covers coppers and high-Cu alloys, bronzes, and brasses. Includes a flow sheet for each group. (S10, Cu)

161-S. Rapid Identification of Metal Finishes. A. Lewis and D. R. Evans. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 58-60.

Portable spot-testing kit developed by Western Electric, now commercially available. Chart shows the sequence of analysis. (S10)

162-S. Examination of Plated and Protective Coatings by Electrographic Analysis. N. Galitzine and S. E. Q. Ashley. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 61-68.

Application to plated or coated surfaces, and examination of them for holes. The apparatus, as well as electrographic prints. (S10, S11)

163-S. Field Test Kit and Procedure for Use in the Rapid Identification of Some Nickel Alloys and Stainless Steels. Henry B. Lea. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 69-72; disc. p. 72.

Use in identifying Ni; monel metal; Inconel; AISI 316 (18-8Mo), Cr-Ni, and Cr stainless steels; and carbon and low-alloy steels. (S10, Ni, CN, AY, SS)

164-S. Rapid Tests for Identifying Alloy Steels. Elbert C. Kirkman. *American Society for Testing Materials,* "Symposium on Rapid Methods for the Identification of Metals," 1950, p. 73-76.

Semi-quantitative spot-test methods. Reagents and equipment, and individual tests for Ni, Mn, Mo, Cr, and Co in stainless and high-alloy steel, as well as one for spot testing four steels simultaneously. (S10, SS, AY)

165-S. Development of Nondestructive Materials Testing. (In German.) Rudolf Berthold. *Chemie-Ingenieur-Technik,* v. 23, Jan. 28, 1951, p. 33-38; Feb. 14, 1951, p. 65-68.

Part I: methods and equipment developed and perfected in recent years, including irradiation and magnetic methods. Domestic and foreign procedures and equipment. Part II: electrical, acoustic, thermal, and chemical processes. 109 ref. (S13)

166-S. Rapid Shop Analysis and Determination of Changes in the Phosphorus Content in Copper and Copper-Alloy Melts. (In German.) H. von Zeppelin. *Giesserei,* v. 38, (new ser., v. 4), Feb. 8, 1951, p. 51-52.

Close correlation between P content and electrical conductivity makes it possible to control it by means of a modern electromagnetic measuring device. (S11, Cu)

167-S. Optical Temperature Measurements on Luminous Flames. (In

German.) Gerhard Naeser and Werner Pepperhoff. *Archiv für das Eisenhüttenwesen*, v. 22, Jan.-Feb. 1951, p. 9-14.

Optical properties of luminous flames; calculation of the true flame temperature from the color and black temperature; wave-length dependence of absorption coefficient of luminous flames; and size of carbon particles in luminous flames. Measurement of flame temperatures with the color-brightness pyrometer. Includes a nomogram, tables, graphs, and eelctron micrographs. 12 ref. (S16)

168-S. The Use of Schematic Flow Diagrams in the Metallurgical Laboratory. (In German.) Hans Ulrich von Vogel. *Archiv für das Eisenhüttenwesen*, v. 22, Jan.-Feb. 1951, p. 31-36; disc. p. 36.

How flow charts of rapid methods for analysis of metals can greatly reduce the cost of experimentation. Illustrated by typical examples. (S11)

169-S. Progress in Steel-Plant Chemistry. (First Half of 1950.) (In German.) Paul Klinger. *Stahl und Eisen*, v. 71, Mar. 1, 1951, p. 252-255; Mar. 15, 1951, p. 300-304.

Emphasis is on analytical and test procedures. 50 ref. (S11, Fe, ST)

170-S. Comparative Tests With Different Separation Equipment for Magnetic Analysis. (In Swedish.) Sture Mörtsell. *Jernkontorets Annaler*, v. 134, No. 12, 1950, p. 572-581.

Comparative tests with a star magnet and a hand magnet showed that the hand magnet is much superior. Comparison between the Davis Magnetic Tube Tester and the hand magnet showed that for certain particle sizes and degrees of liberation about the same results could be obtained. The principal difference is that the hand magnet will separate mixed grains from clean magnet grains. Also hematite can be separated from other minerals by the hand magnet. (S10)

171-S. Evaluating the Characteristics of Glossy Finishes. Allen G. Gray. *Products Finishing*, v. 15, Apr. 1951, p. 46, 48, 52, 56, 58, 62, 64, 66, 68, 70, 74, 76. (Based on paper by H. R. Luck and R. C. Archibald.)

A method for photographing the details of glossy panels. The unique advantage cited for the technique is that the surface irregularities of an entire test panel may be revealed. The method makes it possible to put on the same photograph a comparison of the characteristics of the test panel and those of an ideal smooth glossy panel. (S15)

172-S. New Steel Compositions to Conserve Critical Alloying Elements. *Materials & Methods*, v. 33, Apr. 1951, p. 105, 107.

Five new grades of steel have been developed to conserve Mn, Ni, Cr, and Mo. These are the boron steels 80Bxx, 81Bxx, and 94Bxx, the 81xx steels, and the modified 86xx steels. Composition limits are tabulated. (S22, AY)

173-S. Experimental Spectroscopic Investiagtion of Welds. (In Russian.) E. S. Kudelya. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 76, Jan. 21, 1951, p. 395-397.

Method and technique for spectroscopic investigation of the surface layers of welds and hot cracking. Layers of metal 0.002 to 0.003 mm. thick were analyzed. Practical application of the method. (S11, K9)

174-S. (Book) **Symposium on Rapid Methods for the Identification of Metals.** *American Society for Testing Materials*, Special Technical Publication 98. 1950, 77 pages. $1.75.

Consists of nine papers presented at Atlantic City meeting, June 28, 1949, with accompanying general discussion. Individual papers are abstracted separately. (S10)

175-S. (Book) **ASTM Manual on Quality Control of Materials. Part I. Presentation of Data. Part 2. Presenting ± Limits of Uncertainty of an Observed Average. Part 3. Control Chart Method of Analysis and Presentation of Data.** *American Society for Testing Materials*, Special Technical Publication 15-C; 1951. 127 pages. $1.00. (S12)

176-S. (Book) **ASTM Standards on Copper and Copper Alloys.** 542 pages. Jan. 1951. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $4.35, paper; $5.00, cloth.

Includes 20 specifications on Cu, Cu alloys, and Cu-covered steel wire, rods, bars, and stranded conductors for electrical purposes; 13 specifications covering various nonferrous metals such as slab Zn, Ni, Si-Cu, Pb, and others; 62 specifications on various Cu and Cu-alloy products including plate, sheet, strip, wire, rods, bars, shapes, pipe and tubes, sand and die castings, arc welding electrodes, and brazing solder. Also includes ten test methods covering expansion, mercurous nitrate, resistivity, tension, micrographs, hardness, sampling, and grain-size evaluations. Finally, two recommended practices: preparing tension-test specimens of Cu-base alloys for sand castings; and designation of significant places in specified limiting values. (S22, Cu)

177-S. (Book) **ASTM Methods of Chemical Analysis of Metals.** 476 pages. 1950. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $6.50.

Greatly expanded over 1946 edition. Previous methods are supplemented by many new testing procedures. Metals and alloys covered include ferrous metals and alloys, ferro-alloys, Ni-Cr-Fe alloys, Ni and Ni-Cu alloys, Cu and Cu-base alloys, Al and Al-base alloys, Mg and Mg-base alloys, Pb, Sn, Sb and their alloys, silver solders, Zn and Zn-base alloys. (S11)

178-S. (Book) **A Bibliography of Statistical Quality Control—Supplement.** Grant I. Butterbaugh. 141 pages. University of Washington Press, Seattle 5, Wash. $2.00.

Supplement covers the period from 1946 to June 1949, and includes approximately 725 additional listings. The index is for both the original volume and the supplement. (S12)

179-S. (Pamphlet) **Radioactive Tracers in Metallurgical Research.** W. S. Eastwood, W. G. Marley, H. M. Finniston, and A. E. Williams. 1950, 55 pages. *Atomic Energy Research Establishment*, London, England.

Methods of producing isotopes and the nuclear processes by which they decay to a lower energy state. Methods for detection and counting nuclear changes. Use of tracers in metallurgy, especially in the study of diffusion. Control of health hazards from radioactive materials. 95 ref. (S19)

180-S. (Book) **Chemical Analyses of Cast Irons and Foundry Materials.** W. Westwood and A. Mayer. Over 550 pages. George Allen & Unwin, Ltd., Ruskin House, 40 Museum Street, London, W.C. 1, England. 42 s.

One of a series of manuals on foundry technology, edited by J. G. Pearce. Laboratory practice and apparatus; methods used for determination of 25 elements which can be present in cast iron. Sampling and analysis of iron ore, slags, sands and refractories, coke and coal dust; analysis of linseed oil. (S10, E general, CI)

181-S. (Pamphlet) **Normes, Japonaises Relatives aux Aciers et Alliages Utilisés dans l'Aviation Militaire et l'Aeronavale.** (Japanese Standards for Steels and Alloys used in Military and Naval Aircraft Construction). Centré de Documentation Sidérurgique, 6 rue de Lota, Paris (16), France. 11 tables (20 x 16 in.), 1950. 2000 francs.

Standards have been translated from Japanese into French in the form of an album. (S22)

T

APPLICATIONS OF METALS IN EQUIPMENT

134-T. A 4000° Furnace. W. E. Few and G. K. Manning. *Metal Progress*, v. 59, Mar. 1951, p. 364-365.

In a study for ONR of the solubility limits of O_2 and C in Mo, it was necessary to build a metallurgical furnace capable of operating as high as 4000° F. The furnace filled the requirements both from the standpoint of ease of maintenance and of adequate temperature control. The heating element is a tube, 13 in. long and ¾ in. diam., made of 0.005-in. Mo sheet. Surrounding this element are a number of radiation shields, also of 0.005-in. Mo. The entire assembly is enclosed within a vacuum-tight, water-cooled steel shell. (T5, Mo)

135-T. Conservation of Critical Raw Materials. *Tele-Tech*, Apr. 1951, p. 39, 72, 74.

Design changes made by RCA and Philco to effect savings in TV-receiver manufacture. Charts indicate savings in Al, Cu, Si steel, Alnico, and NiZn ferrite. Claims that performance of the new sets is as good as that of the old. (T1, Al, Cu, SG-n, AY)

136-T. New Tower Design Incorporates Corrosion Resistant Crossarms. *Electric Light and Power*, v. 29, Mar. 1951, p. 76-80.

Use of Al-alloy crossarms on high-voltage transmission lines in industrial areas where frequent painting is required. (T1, Al)

137-T. Fighter Wing Redesigned for Magnesium. D. H. Black. *Iron Age*, v. 167, Mar. 29, 1951, p. 90-92.

Experimental wings of thick Mg sheet made by East Coast Aeronautics and successfully applied to the Lockheed F80C. This construction eliminates many stiffeners, will save manufacturing time, and carries 30% more fuel. (T24, Mg)

138-T. No Backlash With This Aluminum Fishing Reel. *Modern Metals*, v. 7, Mar. 1951, p. 50. (T10, Al)

139-T. The Truth About Magnesium. George W. Orton. *Modern Metals*, v. 7, Mar. 1951, p. 52-53.

An Air Force captain takes issue with some arguments against the use of Mg. Cites examples of successful use. (T24, Mg)

140-T. Materials at Work. *Materials & Methods*, v. 33, Mar. 1951, p. 84-86.

Hearing-aid electron-tube grids (nickel); electroformed Ni dies for aircraft parts; Mg safety tongs; giant alloy steel forging for ore crusher; nickel-silver gage pointer; and several uses of non-metals. (T general, Ni, Mg, Cu, AY)

141-T. Alternate and Substitute Materials for Electrical Equipment and Parts. *Materials & Methods*, v. 33, Mar. 1951, p. 107.

Opposite 55 categories of electrical equipment and parts are shown "former material" and "substitute material". Includes structural parts, magnet materials, contact materials, resistance materials, conductors,

solders, thermocouple alloys, thermostat elements, etc.
(T1, SG-a,f,n,p,q,r,s)

142-T. The Man Who Doomed Whiskers. A. W. Martinez. *Steelways,* v. 7, Mar. 1951, p. 24-27.
Procedures and equipment for production of razor blades. Includes history of the development of the industry, first by Gillette, then by Gem, Schick, and others. Processes include slitting, honing, lacquering, heat treating, and inspection.
(T6, G15, G19, ST)

143-T. The Production of Motors for 3.5-In. Rocket Projectiles. *Machinery* (London), v. 78, Mar. 8, 1951, p. 386a-386L.
Miscellaneous fabrication equipment and procedures. Includes machining, forming, heat treatment, and welding. Material is a low-alloy Cr-Mo steel.
(T25, G general, AY)

144-T. B.S.A. Cast Milling Cutters. *Machinery* (London), v. 78, Mar. 15, 1951, p. 451-453.
Production from an alloy steel containing 1.3% C and 13% Cr, plus small amounts of W and V. Performance data. Micrograph shows uniform spheroidized structure obtained. (T5, G17, AY, TS)

145-T. Pit-Props in Aluminium Alloy. *Light Metals,* v. 14, Feb. 1951, p. 66-72; Mar. 1951, p. 126-129.
First section of a summary of current ideas and conclusions on the subject, by authorities in Germany and Great Britain. Begins with a condensed version of a paper by Hoevels, *Glückauf,* v. 85, 1949, p. 925, describing use in Ruhr mines. Compares mechanical and physical properties of steel and duralumin. Second part gives details of British investigations. (T28, Al)

146-T. Melbourne—The Royal Show. C. Homer Fraser. *Light Metals,* v. 14, Mar. 1951, p. 151-153.
Survey of Australian uses of Al and its alloys, as exhibited at a recent show. (T general, Al)

147-T. Packaging on Show. *Light Metals,* v. 14, Mar. 1951, p. 154-157.
Packaging uses of Al exhibited at Olympia, London, Jan. 30-Feb. 9, 1951. (T10, Al)

148-T. Experimental Work Operation of Electric Furnaces With Screen Insulation. (In Russian.) K. A. Valentinovich. *Promyshlennaya Energetika* (Industrial Power), v. 7, Dec. 1950, p. 6-8.
Experiments in which screen insulation replaces the standard brick structure with refractory lining. The brick walls are replaced by a series of thin screens of metal and ceramic material having air spaces between them. Results indicate that such furnaces heat up many times faster than ordinary furnaces, resulting in about 40% decrease of electric-power consumption and considerable reduction in maintenance costs. (T5)

149-T. Conservation of Critical Materials. *Electronics,* v. 24, Apr. 1951, p. 84-87.
Savings in Alnico, Al, brass, Cu, Co, Ni, steel, Sn, and Zn for television-receiver construction achieved by RCA and Philco, by use of substitute materials. Performance is said to be equal or superior to older models. (Tl, SG-n, Co, Al, Cu, Ni, ST, Sn, Zn)

150-T. Material-Saving Picture Tube. L. E. Swedlund and R. Saunders, Jr. *Electronics,* v. 24, Apr. 1951, p. 118-120.
Diagrams show how electrostatic-focus electron gun eliminated magnetic assemblies using critical Alnico-5 and Cu. Automatic correction of focus with line-volatge change or brightness adjustment is also provided. Focus voltage is obtained by rectification of pulses at the plate or the horizontal-deflection amplifier. (Tl, Cu, SG-n)

151-T. Mixed Ferrites for Recording Heads. Robert Herr. *Electronics,* v. 24, Apr. 1951, p. 124-125.
Inexpensive ferrite heads show promise as substitutes for magnetic-recording units using critically short Ni. Advantages are simple construction with no laminations, minimized eddy-current losses at high frequencies, and reduced head wear in continuous-duty applications.
(Tl, Ni, SG-n)

152-T. Critical Metals Usage Slashed in Revised Television Circuits. A. H. Allen. *Steel,* v. 128, Apr. 2, 1951, p. 78-81.
How Co has been eliminated and major economies effects in requirements for transformer steel, Al, Cu, Ni, and ferrites by Philco. Quality is said not have been reduced.
(Tl, Co, Al, Cu, Ni, SG-n, p)

153-T. Trim Aluminum, Copper, Zinc Parts in Vacuum Cleaners. *Steel,* v. 128, Apr. 2, 1951, p. 83.
Substitution program.
(T10, Al, Cu, Zn)

154-T. Metallurgical Factors Affecting Drill-Collar Performance. P. J. Stoup. *Oil and Gas Journal,* v. 49, Apr. 12, 1951, p. 97-98, 100, 101.
Present manufacturing procedures for drill collars with special reference to metallurgical factors. Selection of steel, collar design, forming and heat treating procedures, methods for testing and inspection. (T28, ST)

155-T. Tantalum Partly Replaces Columbium Content of Electrodes. R. D. Thomas, Jr. *Iron Age,* v. 167, Apr. 5, 1951, p. 109-111.
Experimental results show that a new Type 347 welding electrode coating that conserves columbium provides about the same tensile and stress-rupture properties, corrosion resistance and crack sensitivity. However, since both Cb and Ta are in short supply, Type 308 electrodes can often be substituted for both old and new stabilized types.
(T5, K1, SS)

156-T. Engineers Seek Light on Strategic Materials. *SAE Journal,* v. 59, Apr. 1951, p. 54-58, 60.
Summarizes discussion of substitutes for scarce metals, at SAE National Passenger-Car, Body and Materials Meeting, Detroit, Mar. 6-8.
(T21)

157-T. Aluminum Roof for Bridge Deck. *Engineering News-Record,* v. 146, Apr. 5, 1951, p. 41.
Use as replacement for galvanized sheet steel on Louisiana's Huey Long Bridge. (T26, Al)

158-T. The Story of High-Quality Electrodes. *Industry & Welding,* v. 24, Apr. 1951, p. 48-49.
Production by General Electric Co. (T5)

159-T. Meehanite Castings Find Wide Use in Steel Plants. C. E. Herington. *Steel,* v. 128, Apr. 9, 1951, p. 81-82.
Some current applications. Tables give physical properties of general engineering types and heat resisting types, also maximum working temperatures of the latter.
(T5, CI)

160-T. The Use of Light Alloys for Mechanical Handling Equipment. J. N. Riley. *Machinery Lloyd* (Overseas Edition), v. 23, Mar. 17, 1951, p. 76-77, 79.
(T5, Al, Mg)

161-T. Aluminum in Hot Beds and Greenhouses (In French and German.) G. E. Huenerwadel. *Aluminium Suisse,* Jan. 1951, p. 13-16.
Several examples of Al application as framing material for the glass. (T26, Al)

162-T. Application of Corrugated Aluminum Sheets to Roofing and Sheathing (In French and German.) *Aluminium Suisse,* Jan. 1951, p. 32-34.
As applied to several large buildings. (T26, Al)

163-T. Cast Iron Containing Nodular Graphite as a Construction Material. (In German.) Adalbert Wittmoser. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 93, Jan. 21, 1951, p. 49-57.
Comparative experimental study of various iron alloys show that nodular cast iron combines valuable properties of gray iron with those of malleable iron and cast steel and thus is a suitable material for machine and engine construction. 36 ref. (T25, T5, Q general, CI)

164-T. Experience With Wing Burners for Heating Furnaces. (In German.) Friedrich Morawe. *Stahl und Eisen,* v. 71, Mar. 1, 1951, p. 244-246.
Use of the wing burner and its design; shows that it is superior from the standpoint of simplicity and inexpensiveness to many other types of burners. (T5)

165-T. Conserving Critical Materials. S. C. Spielman. *Electrical Manufacturing,* v. 47, Apr. 1951, p. 124-128, 256, 258.
How the radio and television industry have reduced use of Co, Ni, Al, Cu, and Zn by redesign.
(T1, Co, Ni, Al, Cu, Zn)

166-T. Structural Rigidity With Die Cast Frames. *Die Castings,* v. 9, Apr. 1951, p. 21-22, 60-61.
Use of Zn and Al die castings to replace Fe and Al sand castings in photographic enlargers made by Elwood Pattern Works, Inc., Indianapolis. (T9, Zn, Al)

167-T. Die Cast Aluminum for Non-Magnetic Housing. *Die Castings,* v. 9, Apr. 1951, p. 23.
Application to fishing reels. Magnetic field controls backlash.
(T10, Al)

168-T. Die Castings Featured in U. S. Industrial Design 1951. *Die Castings,* v. 9, Apr. 1951, p. 24-25.
A few illustrations from book, published by Studio Publications and Thomas Y. Crowell Co., New York. (T general)

169-T. Low Cost Hydraulic Fittings. *Die Castings,* v. 9, Apr. 1951, p. 26-28, 55-56.
Zn die castings in hydraulic fittings for auto jacks. (T7, Zn)

170-T. Brass-Plated Die Castings Withstand High Humidity. *Die Castings,* v. 9, Apr. 1951, p. 30-31, 54-55.
Nameplates and trim on refrigerators. 85-15 brass is applied to Zn-alloy castings. (T10, L17, Cu, Zn)

171-T. Designers Look to Stronger Airframe Materials. Leo Schapiro. *Steel,* v. 128, Apr. 16, 1951, p. 77-80.
Mechanical and fabrication properties which include new Cr-Mo steels, Ti, Al, and Mg alloys.
(T24, Q general, AY, Ti, Al, Mg)

172-T. Carbide Insert Bits. A. J. Zinkl. *Mining Engineering,* v. 3, Apr. 1951, p. 312-314.
Results of 2-year test which led to adoption of carbide insert bits at Iron King mine, Shattuck-Denn Mining Corp., Humboldt, Ariz. Includes cost data. (T6, T28, Cn)

173-T. Production and Metallurgical Characteristics of Mining Hollow Drill Steel in Australia. Daniel Clark. *Metallurgia,* v. 43, Mar. 1951, p. 112-117.
Historical aspects of the change, including developments in hollow drill-steel manufacture, and present-day practice. Includes casting, sawing, drilling, rolling, welding, tensile testing, straightening, inspection, etc. Both carbon and alloy steels are used. (T28, CN, AY)

174-T. Certain Peculiarities of Thermistor Characteristics When Used as Elements in Nonlinear Circuits. (In Russian.) G. L. Polisar and L. V. Lokteva. *Doklady Akademii Nauk SSSR*

(Reports of the Academy of Sciences of the USSR), new ser., v. 76, Jan. 21, 1951, p. 403-406.
Stability of volt-ampere characteristics with time. Different metals with high melting points were tested for use as incandescent wires in thermistors. New practical applications for thermistors. (T1, SG-h)

175-T. Problems of Production of Electrodes With High-Quality Coatings. (In Russian.) K. V. Petran. *Avtogennoe Delo* (Welding), v. 21, Dec. 1950, p. 7-10.
Dependence of chemical composition of metal deposited on particle sizes of coating materials; influence of physical characteristics of coating components on chemical composition of deposited metal; dependence of gas formation on time of contact of unpassivated complex ferro-alloys with liquid-glass solution; mechanical properties of deposited metal; and influence of different heating conditions on impact strength of deposited metal. (T5)

176-T. (Book) **Der Stahlhochbau.** (Steel Construction). Vol. I. C. Kersten. 234 pages. 1949. W. Ernst & Sohn, Berlin, Germany. 15.60 DM.
Detailed information on the materials used in steel construction, workshop practice, and site work. Drawings and diagrams deal with everything from the making of pig iron to the latest German standard specifications for bolts, nuts, screws, and rivets. Includes chapters on welding, riveting, and anti-corrosion measures. Machinery and equipment used in steel fabrication and structural enginering.
(T26, K general, S22, ST)

V

MATERIALS
General Coverage of Specific Materials

44-V. Steels for Plastic Molds. *Metal Progress,* v. 59, Mar. 1951, p. 402, 404-405, Condensed from "The Plastic Mold Steels—Their Selection and Treatment," Lester F. Spencer.
Previously abstracted from *Tool Engineer.* See item 223-V, 1950. (TS)

45-V. Pure Iron. *Metal Progress,* v. 59, Mar. 1951, p. 405-406. Extracted from reports of National Physical Laboratory, England, 1948 and 1949.
Development of equipment and procedures for production of 25-lb. ingots of 99.96% iron and its alloys. Studies of mechanical properties and transformations. (Fe)

46-V. German Light Metal Industry. J. B. English. *Metal Progress,* v. 59, Mar. 1951, p. 426, 428, 430. Condensed from "The Non-Ferrous Metal Industry in Germany During the Period 1939-1945; Light Metal Portion", BIOS Report No. 23.
Original previously abstracted. See item 77-V, 1950. (Al, Mg)

47-V. Russians Have New Heat-Resistant Alloys. S. L. Case. *Iron Age,* v. 167, Mar. 22, 1951, p. 65-69.
Summary and evaluation of recent Russian literature in the field of Fe-Cr-Al alloys which, because of shortages of Ni and Co in the U.S.S.R. during World War II were introduced as a substitute for use in electrical resistors and other high-temperature uses. The electrical resistance of such ternary alloys increases with increased Cr and Al contents; Al exerts a stronger influence than Cr.
(P16, Fe, Cr, Al, SG-h,q)

48-V. Nickel-Chromium-Molybdenum Steels. *Materials & Methods,* v. 33, Mar. 1951, p. 105.
Data sheet covers compositions, physical and mechanical properties, fabricating properties, corrosion resistance, available forms, and uses. (AY)

49-V. Metallurgy Bucks a Heat Wave. John Edwards. *Steelways,* v. 7, Mar. 1951, p. 20-23.
Development of high-temperature steels and alloys for use in gas turbines, rockets, ramjet engines, etc. (T25, SG-h, ST)

50-V. More Notes on Beryllium. H. Manley. *Atomics* (London), v. 2, Mar. 1951, p. 84-87.
Be ores and their grading, Be metal and its properties, Be-Al alloys, and toxicity. (Be)

51-V. Magnesium. A. Short. *Machinery Lloyd* (Overseas Edition), v. 23, Mar. 17, 1951, p. 68-71, 73, 75.
Methods of production, properties, and applications. (Mg)

52-V. Ten Years of Progress in the Aluminum Industry (In French and German.) *Aluminium Suisse,* Jan. 1951, p. 5-12.
Modern methods of producing and processing (casting, extending, welding, enameling), Al and its alloys; also their uses in the home and in industry. (Al)

53-V. Choice of Alloys for Aluminum Casting. (In German.) A. Buckeley. *Giesserei,* v. 38, (new ser., v. 4), Mar. 8, 1951, p. 111-112.
Properties and uses of different Al alloys. A table lists compositions, casting properties, and uses of ten different alloys. (Al)

54-V. Nickel-Aluminum Alloy Combines Strength and Corrosion Resistance. Philip O'Keefe. *Materials & Methods,* v. 33, Apr. 1951, p. 73-77.
Properties of new alloy called "Duranickel" which contains 93.7% Ni, 4.4% Al, and smaller amounts of Cu, Mn, Fe, Si, C, and S. Advantages for uses where high hardness and great strength at room and high temperatures are required in addition to excellent corrosion resistance. Fabrication properties and heat treatment. (Ni, SG-g, h)

55-V. (Book) **ABC of Iron and Steel.** Ed. 6. Dan Reebel, editor. 440 pages. 1951. Penton Publishing Co., 1213 W. Third St., Cleveland 13. $10.00.
Twenty-seven chapters, each written by an expert on a particular subject. Subjects are: Iron ore mining, beneficiation, and reserves; iron ore transportation and handling; metallurgical coke and resultant coal chemicals; scrap iron and steel; pig iron; openhearth steel; bessemer steel; electric arc furnace steel; wrought iron; art of roll pass design; semifinished steel; structural shapes and rails; merchant shapes; bars; plates; butt and lap-welded pipe, conduit, and electric metallic tubing; seamless steel pipe and tubes; wire and wire rods; hot and cold rolled strip and sheets; tin plate; stainless steel; toolsteel; forgings; gray iron castings; malleable iron castings; steel castings; and high-alloy steel castings. The material was originally published in *Steel* and has been abstracted separately. (Fe, ST)

56-V. (Book) **The A-B-C's of Aluminum.** G. W. Birdsall. 96 pages. 1950. Reynolds Metals Co., 2500 S. 3rd St., Louisville 1, Ky. Free.
Divided into 3 principal sections: alloys; benefits; and uses. A special feature is a series of 69 pictures and charts arranged in sequence to show how Al is produced from raw ore; made into metallic Al; and then processed to form sheet, rod, bar, and other mill products. Pictures of typical fabricating operations such as welding and forming. (Al)

57-V. (Book) **The Aluminum Data Book.** 194 pages. 1951. Reynolds Metals Co., 2500 S. 3rd. St., Louisville, Ky. Free.
Pocket-size manual contains 117 tables of data on physical, chemical, and mechanical properties; standard tolerances; weights; standard sizes and production limits; as well as much fabricating data. Includes tables showing relative corrosion resistance, action of many chemicals, elevated and low-temperature properties, fatigue strengths, minimum-bend radii, joining methods, finishes for aluminum. Illustrations show various operations in the production of aluminum. (Al)

58-V. (Book) **Bearings; Engineering and Purchasing Data.** 173 pages. Cleveland Graphite Bronze Co., 17000 St. Clair Ave., Cleveland.
Standard size lists, manufacturing and research, technical data, and submission data sheets. Casting, machining, and plating processes; performance characteristics; analyses; applications; and product design. (SG-c)

59-V. (Pamphlet) **The Engineering Properties of Cast Iron.** R. G. McElwee, chairman. American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5. 1950, 93 pages.
Committee report describes the general chemical and physical nature of cast iron emphasizing outstanding physical and mechanical properties. Various grades of cast iron are compared with other ferrous-base metals. A guide to the design engineer. Tabulates specific applications, giving a typical analysis and properties for each. Theories relating to properties and preferred practices. (Q general, P general, CI)

60-V. (Book) **Alcoa Aluminum and Its Alloys.** 178 pages. 1950. Aluminum Co. of America, Pittsburgh.
Chemical, physical, and mechanical properties; heat treatment; corrosion resistance; wrought products; choice of alloy and general design characteristics for castings; and fabricating practices. (Al)

61-V. (Pamphlet) **The Use of Aluminium Alloys in Structural Engineering.** Nov. 1950, 44 pages. Aluminium Development Association, 33 Grosvenor St., London W. 1, England.
Examples of aluminum structures in service. Structural alloys, their mechanical properties, design, durability, and fabrication methods.
(T26, Al)

62-V. (Book) **Aluminium—Taschenbuch** (Aluminum Handbook). Ed. 10. Over 600 pages. Aluminium-Zentrale E.V., 31 Alleestrasse, Düsseldorf, Germany. 12.60 DM.
Covers every phase of the subject in 15 major sections, 70 sub-sections, and a few hundred sub-sub-sections. Various employers' organizations and standard specifications both for the pure metal and its alloys. Publications and books on the subject are detailed in an appendix and elsewhere. (Al)

New Corporation for Titanium

P. R. Mallory & Co., Inc., Indianapolis, Ind., and Sharon Steel Corp., Sharon, Pa., have formed a jointly owned company for the development, production and marketing of titanium and its alloys. The new organization, to be known as Mallory-Sharon Titanium Corp., will offer a series of proprietary alloys to meet the demands of various industries and the Armed Services. The office of the corporation will be located initially in Indianapolis.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

ENGINEERS: Immediate openings for several young (25 to 27), single, mechanical, technical or metallurgical engineers with sales aptitude. Opportunity to work directly with head of established manufacturer of chemicals and equipment in customer and prospect contact and service. Give complete information including training and experience. Employment will be east of the Mississippi River. Box 5-5.

SALESMAN: Nationally known steel distributor has opening in western New York State for salesman 25 to 35 with some metallurgical experience or training. Sales or mill experience desirable. Give qualifications, education and experience and enclose photo. Box 5-10.

METALLURGIST: For development work in process metallurgy under laboratory conditions. Metal casting, heat treating, and development of ferrous and nonferrous alloys for special application (instruments). B.S. in metallurgy plus industrial experience desired. In reply give general qualifications, draft status, and salary expectations. Box 5-15.

Midwest

METALLURGISTS: Large Cleveland manufacturer of automotive and aircraft parts requires two metallurgists for research and development in powder metallurgy. Give complete reply. Box 5-20.

METALLURGIST: Familiar with dynamometer operations for test and development work on automotive engine parts and accessories. Cleveland company. The reply should include personal, educational and work history. Box 5-25.

METALLURGIST: Excellent opening in well known laboratory engaged in ferrous and nonferrous metallurgical research. Applicant should be college graduate in metallurgy and have at least five years of metallurgical experience, some in research. Age 26 to 32. Please furnish full details of education and experience along with salary expected and photograph. Box 5-30.

SALES ENGINEER: For large industrial instrument manufacturer. Prefer mechanical or electrical engineering graduates with a few years industrial instrument experience. Good opportunity with fast-growing company. Location: Detroit. Box 5-35.

METALLURGIST: Progressive, modernly equipped commercial heat treating firm offers excellent opportunity to man with minimum of years diversified experience as plant metallurgist. Duties will include control of heat treating cycles; preparation and direction of educational program for heat treaters; contact and engineering work with customers. Salary and bonus. Give complete qualifications, experience, references, and salary desired. Location: Chicago. Box 5-40.

WELDING RESEARCH ENGINEER: To develop research program on welding problems for major petroleum refiner. Location: Chicago. Require graduate metallurgist, preferably with advanced degree, with extensive experience in welding research. Age 28 to 40. Give full details of training, experience, and salary requirements in reply. All inquiries will be treated in confidence. Box 5-45.

PRODUCT DESIGNER: Plan, design and improve small metal parts and assemblies made of castings, stampings, and bar stock. Machine design training and experience needed. Well established Cleveland manufacturing firm. Salary. Box 5-50.

TOOL DESIGNER: To plan and design tools and jigs for metal fabricating operations on small castings, stampings and bar stock. Conventional and some special machine tools. Mechanical engineering background desired. Well established Cleveland manufacturing firm. Salary. Box 5-55.

RESEARCH ASSISTANT: Minimum requirement B.S. in metallurgy, chemistry or physics. Research involves metallography, mechanical testing, X-ray work, and statistical studies of property data. Deferments for this type of work in last war. Opportunity for tuition-free advance study. One month's vacation. Give full qualifications and salary expected. Write to Metals Research Laboratory, Carnegie Institute of Technology, Pittsburgh 13, Pa.

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TOOLSTEEL METALLURGIST or service or contact man desired for position in Los Angeles region. Requirements: knowledge of steel mill's product, capacity, and personnel; ability to adapt heat treatment and manufacturing schedules to grades available. Box 5-115.

POSITIONS WANTED

METALLURGICAL ENGINEER: Age 30. Experience includes 2½ years as chief metallurgist for a machine tool company, specifications, direct research, metallurgical laboratory, foundry, welding, plating, heat treatment, and induction and flame hardening methods of heat treatment. Presently acting as consultant for several small organizations. Desires responsible position. East preferred. Box 5-65.

METALLURGICAL ENGINEER: B.S. degree. Age 41. Experience includes five years in plastics research, five years aluminum and brass foundry, two years research in brass mill problems, and four years in pure iron pilot plant production. Able to initiate and control a metallurgical problem. Midwest, especially St. Louis, preferred. Box 5-70.

METALLURGIST: M.S. degree. Desires research or development position. Four years experience in physical metallurgy including X-ray work. Presently employed. Age 29. Married with children, veteran. Prefer East or Midwest. Box 5-75.

METALLURGICAL ENGINEER: Age 32. Married, one child. B.S. in chemical engineering and graduate work in metallurgy and physical chemistry. Former M.I.T. staff member. Experience also includes work in steel mill, consulting, and heavy experience on titanium, zirconium, uranium, beryllium, and high vacuum work. Last position chief metallurgist with large electronic manufacturing company, materials specifications, selection, and all processing. Desires position with future, leading to technical sales or production management. Box 5-80.

METALLURGICAL ENGINEER: B.S. degree. Two years experience in research laboratory of company prominent in production of powder metal products. Experience includes metallography, physical testing and heat treating. Especially familiar with ferrous powders including stainless steel. Desire responsible position in powder metal field, research or production. Midwest or Northeast preferred. Box 5-85.

METALLURGIST: B.S. in physical metallurgy. Age 31. Married, veteran, not a reserve member. Ten years diversified experience in research, development and manufacturing. Anxious to associate with a firm near metropolitan New York requiring a person with metallurgical and engineering experience, executive type. $650 per month minimum salary required. Box 5-90.

DEVELOPMENT and PRODUCTION ENGINEER: With good record of new product and process development. M.I.T. graduate, physical metallurgy. Age 29. Married, veteran. Six and one-half years experience in metal product plant. At present in charge of metallurgical department. Experienced as project engineer for government research contracts. Desires responsible position with progressive company. Box 5-95.

METALLURGIST: Recent graduate desires position with opportunity to do development work in large organization. Considerable machinist background and diesel engine training. Age 26. Married with family, veteran. Aggressive, responsible and capable organizer. M.E. graduate of Stevens Institute of Technology. Box 5-100.

METALLURGIST: B.S. degree. Eighteen years experience in four large steel mills in metallurgical development and control of hot and cold working of strip, bar and wire, stainless and basic steel. Experience in customers' fabricating and field problems. Metallography, physical and chemical research. Desires responsible position in metal fabrication or processing. Box 5-105.

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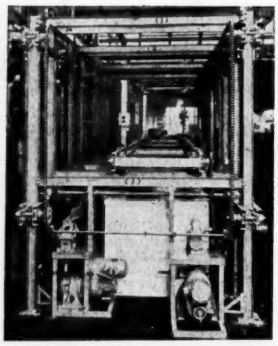

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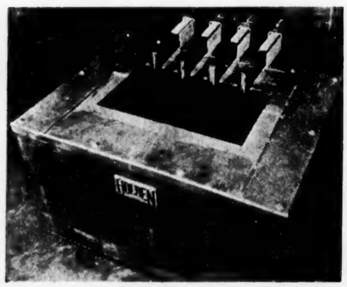

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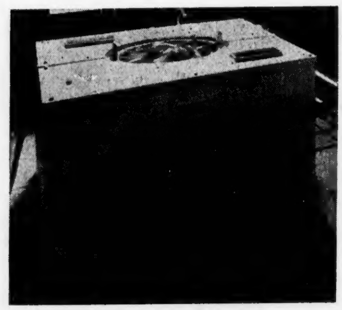

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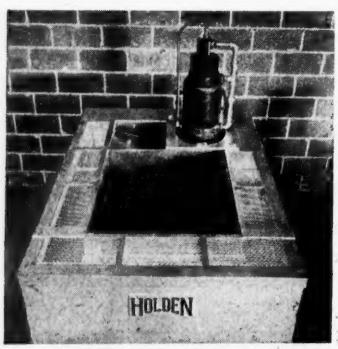

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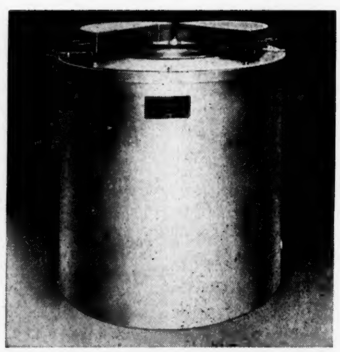

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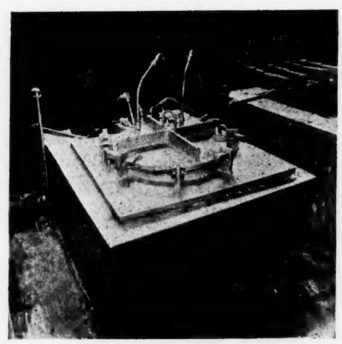

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